THE

NATURAL HISTORY

OF

CORNWALL.

THE

Air, Climate, Waters, Rivers, Lakes, Sea and Tides;

Of the Stones, Semimetals, Metals, TIN, and the Manner of Mining;

The CONSTITUTION of the STANNARIES;

IRON, COPPER, SILVER, LEAD, and GOLD, found in CORNWALL.

Vegetables, Rare Birds, Fiſhes, Shells, Reptiles, and Quadrupeds:

Of the INHABITANTS,

Their Manners, Cuſtoms, Plays or Interludes, Exerciſes, and Feſtivals; the CORNISH LANGUAGE, Trade, Tenures, and Arts.

Illuſtrated with a new Sheet MAP of the COUNTY, and Twenty-Eight Folio Copper-Plates from ORIGINAL DRAWINGS taken on the Spot.

By WILLIAM BORLASE, A. M. F. R. S.

Rector of LUDGVAN, and Author of the ANTIQUITIES of CORNWALL.

---------- *Natale ſolum dulcedine captos*
Ducit.

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MDCCLVIII.

TO THE

NOBILITY and GENTRY

OF THE

COUNTY of CORNWALL,

With great Reſpect.

IT cannot be queſtioned, Gentlemen, but that NATURAL HISTORY is a moſt extenſive Science, taking in all animate and inanimate ſubſtances which Land, Air, or Water contain; explaining their relations, properties, and uſes; and, in ſhort, giving a recital and detail of the whole viſible Creation.

NOR is it a ſcience leſs entertaining than comprehenſive; for if the mind thirſts after variety, and a freſh ſucceſſion of objects, where can ſhe find for contemplation ſo numerous and various a treaſure? If it is ſolicitous after curious workmanſhip, where ſuch fine mechaniſm as in the Animal œconomy, from the Elephant to the Piſmire? If ſtudious of beauty, ſhape, and colouring, where ſuch gracefulneſs as in Man, ſuch tints, delicacy, and luſtre, as in Flowers, Birds, Fiſhes, and Precious-Stones? If moved chiefly by the moſt aſtoniſhing ſcenes of grandeur, we need but look upon the Cliffs or Mountains, upon the Ocean or the Sky.

BUT the mere tranſient gratifications of a curious and inquiſitive mind would not give this ſtudy its deſerved and allowed pre-eminence, if it could not, in an equal degree, inſtruct as well as pleaſe; if it did not correct and exalt, as well as amuſe and engage the mind.

'TIS

'Tis true, this large field, ſo fertile in matter and fully ſtock'd for obſervation, with all its varieties is but a blank and dreary deſart to the heedleſs and inattentive traveller. Bounteous Providence has laid her works before us; ſhe has opened the ſpacious volume of Nature; 'tis our part to read, compare, and underſtand.

Natural History is the handmaid to Providence, collects into a narrower ſpace what is diſtributed through the Univerſe, arranging and diſpoſing the ſeveral Foſſils, Vegetables, and Animals, ſo as the mind may more readily examine and diſtinguiſh their beauties, inveſtigate their cauſes, combinations, and effects, and rightly know how to apply them to the calls of private and public life.

It fills the active and more ſocial mind with ideas, and experimental deductions, profitable to the community, and productive of manufactures, additional employ and commerce. It enables the retired and ſtudious mind to proſecute her contemplations, make diſcoveries and calculations, plan improvements, and aſſiſt ſpeculation; but above all, raiſes the mind, in both circumſtances, to the Author of all theſe things.

The principal uſe therefore of Natural Hiſtory, is, that it leads us directly to Religion; it ſhews us every where the plain footſteps of deſign and intelligence, and points out to us all the attributes of God.

What arguments and words ſhall ſeldom compaſs, the ſmalleſt and leaſt conſiderable of theſe works ſhall effect irreſiſtibly; the eyes of a fly, the wing of an inſect, the ſcale of a fiſh, ſhall manifeſt a Deity to any perſon, who will purſue effects up to their cauſes, beyond contradiction, and above all doubt.

Look where we will, admiration ſeizes us; we perceive the ſtrength and immenſity of ſome works, as well as the inimitable ſkill of others; and we revere the *Power*, as well as ſee the *Wiſdom* of their Great Author; we obſerve the ſplendor and excellency of other

other works, and we ſtand convinced of his GLORY; we find the uſes, ſhapes, and properties in all things different, yet we find them all conſpiring to promote univerſal, mutual good; we ſee them all directed ſo harmoniouſly to one point for the good of the whole, that they muſt needs proceed from one only, conſtantly beneficent, and GRACIOUS GOD. From theſe we deduce and argue the other attributes, and derive our own duties, till Natural Religion ends; but whilſt we are thus enlightning our underſtanding, and admitting that proſpect of the Deity which is diſplayed in his works, gratitude, awed and mixed with reverence, ſupples the heart, and diſpoſes it moſt effectually to embrace all the ſublime and ineſtimable truths of Revelation.

THESE are the undeniable and beneficial conſequences of NATURAL HISTORY in general; but of this noble Science, of this ſtately tree of Knowledge, the NATURAL HISTORY of a particular diſtrict (ſuch as are the following obſervations) is but a branch; it is confined and local, and muſt tend chiefly to the deſcription and improvement of one particular ſpot.

THE ſituation of this county (ſecluded in a manner from the reſt of Britain) renders it, like all diſtant objects, leſs diſtinctly ſeen and regarded by the polite, learned, and buſy world; yet whatever concerns its intereſt and reputation, it need not be urged, Gentlemen, may have ſome claim to your attention, who have a natural connexion with, and relation to it.

IT matters leſs to ſtrangers whether the arts in a diſtant county flouriſh, are at a ſtand, or decay; whether the ſeveral Natural Productions are well or ill managed, underſtood or not; juſtly eſtimated and diſpoſed of, or otherwiſe; but theſe things are moſt proper and intereſting diſquiſitions for the inhabitants.

TO awake attention to the real and publick intereſt of the County, it was neceſſary to ſhew the preſent ſtate of Knowledge with regard to Arts and Metals, and in many particulars to hint at

 alterations

alterations and ſuggeſt improvements; better expedients very likely may occur to others, but ſome are requiſite. In ſpeaking of the Inhabitants, truth required that general failings ſhould be confeſſed, as well as what deſerves the character of martial ſpirit, ingenuity, taſte, and induſtry recorded. For both theſe I make no apology; neither to the publick for mentioning the latter with commendation, nor to you for reprehending the former; concluding that it is more for the honour of our Country to expreſs our diſapprobation of every thing that is ill, than, by endeavouring to conceal and palliate, to incur the imputation of patronizing error, or diſguiſing truth.

To pre-engage your favour, and beſpeak your applauſe, was in no wiſe, Gentlemen, the intention of this addreſs: I am perſuaded ſuch an application would be as vain and impotent with regard to you, as it would appear frivolous to the reſt of the world. The fate of the following work muſt reſt on its own utility, the diligence, diſcernment, (if any) and integrity of the Author, or deſervedly fall for want of theſe its only juſt ſupports.

Accept however my moſt ardent wiſhes (the publick will readily forgive this partiality) for my native County and you. May the ſubject of theſe papers, Cornwall, (formerly reckoned among the Kingdoms of this Iſland, and at preſent ſtill more regarded for its Natural Productions as they become more known) flouriſh - - - under the inſpection of its owners.

May you, Gentlemen, adorn your ancient names and inheritances with every virtue, national, ſocial, and domeſtic; concur with harmony in promoting every rational, public-ſpirited improvement; by the influence of your example give weight and countenance to religion and good manners; by your authority reſtrain the vicious; by your charity relieve the indigent, and generouſly employ the induſtrious.

These are the wiſhes, hopes, and prayers of

The AUTHOR.

SOME introductory Explanation of the Riſe of the following Treatiſe, the Difficulties which interfered, the Aſſiſtances to be acknowledged, the Method, Plan, and Connexion of the whole Work, and the undeniable Imperfections in the Execution of it, muſt here be premiſed, and ſubmitted

TO THE

CANDID READER.

BEING ſollicited, about twenty years ſince, to make a collection of Corniſh foſſils, for ſome learned gentlemen abroad, whoſe names would entitle them to a much ſuperior correſpondence [a], and finding the natural products of this County much commended; being alſo frequently employed afterwards in the ſame office, I became more and more fond of collecting, till my ſpecimens tempted me more narrowly to inſpect and deſcribe them: Several incidents, relating to NATURAL HISTORY, in the mean time occurred, and claimed a notice, which I could not deny them: My country was little known, and my deſire to ſurvey the ſeveral parts of it increaſed, as the deficiencies of what had been publiſhed before became more apparent, and not being wholly deſtitute of thoſe who urged me to this undertaking, I became engaged by degrees, and inſenſibly ventured myſelf ſo far in the following work, that I could proceed with more eaſe, than I could retreat with propriety.

MY ſituation however, was none of the moſt favourable to ſuch an attempt; my diſtance from books and thoſe aſſemblies of the learned who had turned their ſtudies into the ſame chanel, was a diſcouraging, and in ſome particulars, an inſuperable diſadvantage, but with regard to the natural productions, it enabled me to examine them all on the ſpot, and though I had not always before me what the *Literati* had written on the ſame ſubject, I could better underſtand what nature had done.

MR. Ray and Mr. E. Lluyd (both moſt deſervedly eminent in Natural Know- Aids.
ledge) came into Cornwall in queſt of what was remarkable, and ſtayed here ſome time. The former has diligently taken a liſt of our Fiſh and Plants; and though Antiquity participated the attention of the latter, yet he made ſome diſcoveries in each department, and thereby concurred to render them leſs difficult to thoſe, who were to ſucceed him in the ſame reſearches. Dr. Woodward's

[a] Dr. Boerhave, Dr. J. Frederick Gronovius, Dr. Linnæus, and the late Dr. Iſaack Lawſon, then at Leyden.

Method,

Method, and Catagogue of Foſſils, afford many critical deſcriptions of a number of Specimens from Cornwall, and many uſeful theories deduced from them. Some ſcattered Memorandums on our Metals, and Mines, &c. are to be found in the Tranſactions of the Royal Society, and the late Mr. Hutchinſon made ſome juſt obſervations on our Strata and Lodes. I have not made the leaſt advantage of either without naming place and author.

Language. FEW Studies are more uſeful to mankind than NATURAL HISTORY, but it is a particular Science, and to read it with pleaſure and improvement (as there is a connexion betwixt Sciences as well as Arts) will require ſome previous and preparatory knowledge of the learned Languages, and indeed of the ſiſter Sciences.

FOR want of ſufficient and adequate expreſſions in the Engliſh tongue NATURAL HISTORY muſt needs borrow from the Greek and Latin. It muſt alſo ſtruggle to naturalize the technical terms of Geometry, Geography and other Arts, in ſhort, a Natural Hiſtorian for the ſake of properly particularizing ſuch a variety of bodies as fall within his notice, muſt have the liberty of taking words from every hand; the ſenſe would eſcape in long ſentences and a multitude of words; and the unavoidable circumlocutions of the Engliſh tongue, if they did not deſtroy the meaning, would neceſſarily abate the impreſſion.

THESE technical words, however, are inſerted with reluctance, and in ſuch places more eſpecially as by their abſtracted ſpeculations are calculated for the peruſal of thoſe who are moſt converſant in theſe ſtudies.

Method. THE Method which the principal diviſions are thrown into is plain, ſuch as the ſeveral parts of the Treatiſe ſuggeſted, not confined to any ſyſtem; nor the Subjects treated under the general heads, claſſed and digeſted according to the method of any other Writer.

AS the end of Method is perſpicuity, when it appeared to me that I was in poſſeſſion of that, I never thought it neceſſary to ſearch in books for the other. I follow no leader, but I have ſlighted no guidance, nor refuſed to accept of any clue to regulate my conduct: there may be too much of Syſtem, as well as too little; Subjects may be crammed ſo cloſe, that they will hide one another; if they are arbitrarily driven together under a claſs leſs obvious, they will not ſuit their companions, nor become their place, nor be eaſily found.

BUT without an orderly diſpoſition NATURAL HISTORY fares much worſe, 'tis but a confuſed, undiſciplined crowd of ſubjects; diſtinct, clear arrangement places them in their due light, without which, as the eye can ſee no beauty, the mind can judge of no properties, competition, or relation. Though there muſt be no ſhackles, yet order, connexion, rank, and relation, muſt be ſtrictly obſerved, and therefore with other lovers of NATURAL HISTORY I here take a

pleaſure

pleaſure in acknowledging my obligations to him [i] who with a certain brevity and happineſs, peculiar to himſelf, has been indefatigable in digeſting the ſeveral products of Nature into the regularity and comprehenſiveneſs of Syſtems, although a few obſcurities, and perhaps improprieties may remain yet to be retouched.

As I tye myſelf down to no determined Plan, I confine myſelf to no man's Hypotheſis, nor indulge myſelf often in ſuch ſallies of the imagination. It muſt be referred to the acute and patient reader, whether there is any Hypotheſis here, but what appears to him upon cool and ſufficient tryal (as it really does to the Author) either to be ſupported by a variety of facts, or the eaſy plain reſult of the nature of things.

To baniſh all Hypotheſis, whilſt ſo many points of NATURAL HISTORY remain diſputable and undecided, would be to obſtruct one, (and no inconſiderable one) of the avenues to Knowledge. All cautious Hypotheſes muſt be pardoned for aiming at Truth, although they miſs the mark. Hypotheſis.

But an Hypotheſis may be too bold, and when Authors pretend to account for every thing, they are not aware how indecently they intrude into the councils and peculiar province of their maker. There are many ſecrets in nature, which man had better let alone, and wiſely own his ignorance. GOD has given us a ſagacity to diſcern, and faculties to uſe his works; but in a groſs only, and collective ſtate; he has given us no talents to track the firſt principles through their ſeveral migrations and meanders, to tranſmute, deſtroy, and recompoſe the works of Nature; he did not deſign that we ſhould preſumptuouſly reviſe, mimick, or make, but uſe, revere, and celebrate his works. NATURAL HISTORY therefore has its bounds, which if it exceeds, it gets wilfully into the dark, and conſumes our time in endleſs and futile diſquiſitions; NATURAL HISTORY has its bounds, moſt apparent to thoſe who know moſt of it; among the reſt of its uſes therefore (upon proper intimacy) it will certainly teach us a due eſtimate of our own weak abilities, ſhort-ſighted fancies, and at the ſame time the unlimited unfathomable depth and height of the Works of GOD.

SOME pains, it will be eaſily allowed, have been taken to deſcribe and engrave ſuch a number of ſubjects, but pains of this kind, I agree, do not always merit ſucceſs, neither are they entitled to commendation, but when they they are aptly and judiciouſly employed for the illuſtration of truth, and ſettling ſome new or doubtful part of uſeful knowledge. Engravings.

As it might be ſome ſatisfaction to poſterity (I think every one is agreed that it muſt be ſo to us) to ſee the patrimonial habitations of their anceſtors, I have

[b] Linnæus Profeſſor at Upſal, in Sweden.

inſerted the ſeats of ſuch gentlemen as expreſſed their deſire to have them engraved; the fronts were all meaſured, and (which has not, I apprehend, been yet done in ſuch collections) all printed by the ſame Scale [c] (to be applied to the fronts only) except two, whoſe owners choſe to have their houſes leſs, that more of the adjoining country and their own plantations might be inſerted. For theſe plates I am obliged to the Proprietors.

In the other plates, the ſubjects engraved, are either of the natural ſize, or by a ſcale annexed in the ſame plate; for want of which regulation, great obſcurity has attended the engravings of ſome of the moſt celebrated authors, whilſt fiſh and birds, cattle and foſſils, are repreſented without due relation to the ſize of one another. The Subjects engraved are not always new, but the drawings were made from nature, and may be of ſervice upon many occaſions, where authors who have gone before, either could not themſelves delineate, or had no opportunity of ſeeing the natural ſubjects, and were obliged to make drawings after relations, and the haſty ſketches of others.

Not always aiming at what is new, much leſs at what is marvellous, the Author contents himſelf with faithfully repreſenting the natural bodies which came under his examination, as the beſt method of adding his mite to Natural Knowledge, and of making ſome advances, ſure perhaps, though not many.

In the account of Foſſils I may ſeem tedious and too minute to thoſe who have no propenſity to ſuch ſtudies, but let it be conſidered that they are the diſtinguiſhing products of our County, and to thoſe who are ſenſible of what uſe it is to have theſe bodies critically characteriſed, I wiſh I may not appear too ſhort and unſatisfactory.

As our birds, and plants, and quadrupeds cannot be ſuppoſed to be very different from thoſe of the other parts of England, and have moſtly been deſcribed before, they take up leſs time of the Reader here.

A few pages of the book which follows [d] were publiſhed in the Philoſophical Tranſactions of the Royal Society, but they were always intended as parts of this Work, detached indeed and ſent before, though not irrevocably given up by the author, and as diſperſed fragments (unleſs I am miſinformed) I had a right to reviſe, and re-unite them.

[c] The Scale is only affixed to the firſt houſe, viz. Plate IV. page 51.

[d] Treatiſe of the origin and properties of Corniſh cryſtals; a thunder-ſtorm in the pariſh of Gulval; and the agitation of the Sea, on the firſt of November, 1755.

BESIDES theſe repetitions of prior obſervations, there are doubtleſs many miſtakes and faults, as well as errors of the preſs. I ſhall be willing to acknowledge the former, and from the animadverſions of the more knowing, expect the pleaſure of becoming better informed. I print a liſt of the latter, as far as a moſt impartial reviſal could diſcover.

IT could not be otherwiſe than that ſeveral particulars of the following work ſhould relate only to Cornwall, and are of little importance to the generality of the world; but thoſe circumſtances, which concern not the bulk of mankind, the Reader will be ſo good as to conſider, may claim the moſt ſerious thoughts from the inhabitants of the County, and to their ſervice only, he will be content that they ſhould be conſigned. Local obſervations.

IN the deſcriptive part, I have been greatly obliged to the Survey of Cornwall, publiſhed in the year 1602, by Richard Carew, of Eaſt Anthony, in Cornwall, Eſq; who to the nobility of his deſcent, added all the qualifications of the gentleman, ſcholar, and chriſtian: his ſharp apprehenſion, and ſtrong ſenſe, left few topicks unexamined, many, for the knowledge of his time, well noticed.

IT would have been ungenerous to his memory, as well as diſtreſſing and impoveriſhing my Subject, to have neglected his work, tho' he is neither ſlaviſhly copied, or ever made uſe of without acknowledgment. Mr. Scawen's MS relating to Cornwall I am alſo obliged to, eſpecially with regard to the Corniſh Language.

THE geography of Rivers, Harbours, and Creeks, I found extremely deficient; I am therefore the more particular in tracing their courſes and names, in which the Itinerary of Leland has aſſiſted me.

I HAVE added a Map, not to travel by, or with an intent to correct the Maps already publiſhed, (of which Martin's has been of moſt uſe to me) this muſt be done by better hands; but purely for the ſervice of thoſe who will read the Antiquities and Natural Hiſtory of Cornwall.

FOR ſeveral informations in the above mentioned particulars, I have been obliged to ſome gentlemen now living, and for that reaſon, I have mentioned them only in thoſe parts of the work, concerning which they were ſo good as to communicate their Obſervations.

IN the following work then, if the Reader ſhall miſs any entertainment which he might expect, he will perhaps meet with nothing partial, aſſuming, or offenſive.

ſive. The utility of our harbours is not magnified, nor their inconveniences concealed; if the good character which I give the inhabitants, exerciſe the patience of the unintereſted reader, the proper contraſt which Truth required will deſerve his acknowledgment of impartiality. The revenues of the County's ſtaple-commodities are calculated by the moſt diſcerning and converſant in thoſe particulars, and therefore not exaggerated, nor the beauty of our natural productions too highly extolled. Some privileges which we have in preference to other counties, I do not challenge as our due, and the preſent ſtate of Arts is ſo far from being heightened, that it is thought to ſtand in need of many improvements. Allowances will be made, I truſt, for local deſcriptions, but I deſire no quarter for miſrepreſentations. 'Tis the buſineſs of a Civil Hiſtorian, faithfully to draw the characters of mankind, and the motives, origin, connection, and the good and evil tendencies of their actions; 'tis alſo equally the duty of a Natural Hiſtorian to be faithful in exhibiting the works of Nature, to point out the defects of Science, and the imperfections of Arts, to endeavour to rectify what is amiſs, and promote the advancement of what is immature.

A LIST

A

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· Grampont Common · Truro Common · Kea Common · Feock Common · Filley Common · Ruan Lanihorn Common · Car Hays Common · Cury Common · St Eue Common · Tregony Common · Lamorak Common · Kilkhamton Common · Launceston Common · Bodmin Common · Cardinham Common · Lanivet Common · Lanlivary Common · Lanhydrock Common · Lostwythiel Common · Boconic Common · Broadoc Common · Liskeard Common · Callington Common · Stoke Climsland Common · Linkinhorn Common · Northill Common · Lewanick Common · Trebarth Hall Common · Pillaton Common · Quithoc Common · Minheniot Common · Looe Common · Talland Common · Lansalos Common · Lanteglos Common · Polruan Common · Fowey Common · Mevagissy Common · Gorran Common · Veryan Common · Tregony Common · Grampont Common · Truro Common · Penryn Common · Falmouth Common · Helston Common · Mawgon Common · Mawnan Common · Constantine Common · Budock Common · Mabe Penryn Common · Gluvias Common · Wendron Common · Sithney Common · Germo Common · Breage Common · Marazion Common · St Hilary Common · Piran Common · St Michael Mount Common · Penzance Common · Newlyn Common · Madern Common · Gulval Common · Sancred Common · St Just Common · Senan Common · Burien Common · Paul Common · Moushole Common · Zennor Common · Morva Common · Senar Common · St Ives Common · Towednack Common · Lanant Common · Philac Common · Camb Common · Redruth Common · Illugan Common · Sithney Common · Breage Common · Germo Common · Wendron Common · Trenethic Common · Helston Common · Mawgon Common · Mawnan Common · Constantine Common · Budock Common · Mabe Penryn Common · Gluvias Common · Falmouth Common · Penryn Common · Veryan Common · Tregony Common · Grampont Common · Truro Common · Kea Common · Feock Common · Filley Common · Ruan Lanihorn Common · Car Hays Common · Cury Common · St Eue Common · Tregony Common · Lamorak Common

Longitude from London: 6° 50 40 30 20 10 5° 50 40 30 pa. r.

Latitude: 35 30 25 20 15 10 5 50 55 50 45

NATURAL HISTORY OF CORNWALL.

CHAP. I.

The General Deſcription.

CORNWALL, the weſternmoſt County of Britain, in its form reſembling a Cornucopia, has the Briſtol Chanel (a branch of St. George's) on the North, and on the South the Britiſh Chanel; which two parts of the Ocean meeting as it were in a point at the Weſt, encloſe all but the Eaſtern part of Cornwall, where it butts upon Devonſhire. In the pariſh of Morwinſtow, about four Miles from the North Chanel, is a tenement call'd Shorſton, on the outſkirts of which is a large Common called Shorſton-moor, divided from Bradworthy Pariſh in Devonſhire by a hedge for about forty land-yards to the Eaſt, then by a hedge of about a quarter of a Mile long, from the Pariſh of Hartland, Devon; then it butts on the pariſh of Wellcombe, Devon, from which it is divided alſo by a hedge of about a mile in length, and this hedge is therefore the limit of Shorſton Tenement, to the Eaſt and North of the pariſh of Morwinſtow, and of the County of Cornwall, till you come to Gooſham Mill, where a ſmall brook call'd Marſland Water, that riſes near Woolleigh Burrows takes place and divides Cornwall from Devon along to the North Sea. All the reſt of Cornwall (with a few Exceptions to be taken notice of in their proper place) is divided from Devon by the river Tamar, which riſes on the very ridge of Shorſton Moor, about half a mile Eaſt of Woolleigh Burrows, and when it paſſes out of the Tenement of Shorſton commences the general Boundary of Cornwall towards the Eaſt, till it joins the Ocean near Plymouth after a courſe, nearly South, of about forty miles.

The two moſt diſtant points of this County are the Eaſtern angle of the pariſh of Morwinſtow near the ſource of the Tamar, to the Eaſt, and the Promontory call'd the Land's-End, in the pariſh

of Senan to the Weſt, from which extremities this county meaſures ſeventy-eight miles and a half in length,[a] in a line nearly South Weſt and North Eaſt.

In the wideſt part, viz. from the Northern point of Morwinſtow to Ramhead, is forty-three Miles and a quarter, the line nearly South South Eaſt: The land grows narrower as it goes to the Weſt, and at about one third of it's length it is but eighteen Miles from Fauwy on the South ſea to Padſtow on the North. As we advance another third, 'tis thirteen miles from Pendinas Caſtle on the South to Portreath on the North; and from Mount's Bay on the South, to St. Ives Bay and the Briſtol Channel on the North, the land is but five miles wide.

The land thruſting itſelf forward in ſuch narrow dimenſions, declines towards the ſea on either ſide, conſequently the land is higheſt in or near the middle, where it is leſs cultivated than in the lower lands, as indeed leſs capable of cultivation: here, however, as our greateſt Roads paſs, and moſtly through large Commons, and on or near the moſt mountainous parts, the rude proſpect is apt to give travellers a more unfavourable opinion of the County in general than it deſerves; for this barrenneſs is no more than the natural conſequence of high ſituations in all countries, which being more expoſed to the courſe of winds and rain than the plains and valleys, the ſoil is not ſuffer'd to reſt here, but is perpetually waſh'd off into lower and more even ſituations, the Rocks and Karns are laid bare, and the heathy ſoil that remains betwixt them is fit for little but to yield common paſture, and turf for fuel.

On the Northern Coaſt the land is generally high, and the valleys ſhort, narrow and quick of deſcent; the ſea therefore, beſides the two creeks of Bude and Gannel) finds a way only to make two havens, Padſtow and Heyle, and thoſe fit for but Small Craft, but the valleys being more extended and level on the ſouth coaſt, the ſea makes an open entrance into Hammoze, Fauwy and Falmouth Harbours for the largeſt ſhips, and by their ſeveral branches as well as at Loo and Helford, affords eaſy carriage of all conveniencies, either by ſhips, boats, or barges.

Near the ſea, and along the ſides of navigable rivers, and in the plain grounds, this county is well cultivated, and in ſome places well planted, but our plantations make the leſs figure becauſe they are low, and our hills are naked.

It need not be here obſerved that Cornwall is famous for Tin and Copper Mines. The high lands in the Eaſt, bordering

[a] According to Martin's Map, done from an actual Survey.

upon

upon Devon, [b] did formerly afford ſome Tin, but now there is very little Tin eaſt of St. Auſtel [c]. From St. Auſtel weſtward to Kenwyn Gwenap, Stythien, Wendron, Breag, on the South, and to St. Agnes Redruth [d], Illogan, Camborn, Gwinear, in a ſtraight line through Lannant, Senor, and Morvah, to the pariſh of St. Juſt on the North, the Tin and Copper Grounds maintain a breadth of about ſeven miles at a medium.

By the deſcent of the River Tamar, the lands of Morwinſtow where this river riſes, ſhould be reckoned the higheſt hills in this County; but the length of a river's courſe is no infallible criterion of the height of it's ſource: Caradon Hill, near Liſkerd, may be reckoned amongſt the higheſt grounds, being found [e] to be 1186 feet above the level of the ſea. Routor and Brownwilly muſt be ſtill higher, the former being the firſt land diſcovered at ſea by ſhips bearing for England, if I am rightly informed.

By the Domeſday Book (in the Church Library at Exeter) which in all probability was the copy of the Original Survey of the Weſtern Counties, whence the great Domeſday Book in the Exchequer was partly compoſed, the Hundreds are thus named: 1. Conarton; containing 33 Hides [f]. 2. Tibeſterna, aliàs Tibeſta, now a Dutchy Manor, to which Granpont and moſt of the pariſh of Creed, and other dependencies belong, containing 61 Hides and a half. 3. Winnenton, aliàs Winneton, aliàs forſitan Winnianton, formerly a conſiderable Manor of the Arundels of Lanhern, giving name to the pariſh now call'd Gunwallo [g], containing 36 Hides and a half. 4. Stratton, in which there were 83 Hides and three Virgates of land [h]. 5. Fauiton, conſiſting of 43 Hides and a half 6. Rialton, conſiſting of 69 Hides and ſix Farthings [i] of land. The 7th Hundred before the Conqueſt was that of Pauton [k], containing 44

[b] In the pariſhes of Linkinhorn, on Hengſtendown, &c.

[c] This name is written differently, St. Auſtelles, (Leland, vol. iii. pag. 20.) quaſi Holy Altar, as if the pariſh had it's name from ſome remarkable Altar there of great reſort; as the pariſh of Altarnun had that name from a famous Altar of St. Nunne. In vol. vii. of the ſame Itinerary, pag. 111, 'tis call'd St. Auſtols, with this marginal note [St. Auſtol, erat Hermita]. It is alſo call'd St. Auſtol in the Biſhop's Regiſter at Exeter; and it is imagined by a learned gentleman, (Rev. Dr. Milles, Chaunter of Exeter) that the proper way of writing this name is St. Auſſil, a corruption of St. Auxilius an Iriſh Biſhop.

[d] Rectius Ryddruith.

[e] By the Rev. Mr. Haydon's portable Barom[r].

[f] Conarton was an ancient Manor formerly belonging to the Crown of England, and in time of Hen. III. convey'd by letters patent (yet to be ſeen (ſays Hals, in his MS. of Cornwall) at Lanhern, together with the Baylywic of the Hundred of Penwith, to Simon Pincerna (or Butler) Lord of Lanhern, in lieu of the Lordſhip and Manor of St. James at Weſtminſter. In the name of Pincerna it continued till Edward III. when one of the Heireſſes of that family, (i. e. of the Pincerna's) was married to Arundel of Trembleth, direct anceſtor of the laſt Sir John Arundel of Lanhern.

[g] Norden, pag. 46.

[h] Eight Virgæ made a Hide; the Virga or Virgata of land was an uncertain and very different meaſure in different places, it ſometimes conſiſted of 24 Acres, ſometimes of 30, 40, and ſometimes only of 20, 15, or even but 4 Acres. Spelman. Gloſſ. in voce virgata.

[i] A Farthing Land was like the other Meaſures of our anceſtors, various; ſometimes conſiſting of ten Acres, ſometimes of 30. "Diviſiones nuſquam æquæ nec partium quantitas uſquam certa." Spelm. Gloſſ. p. 320.

[k] Rialton and Pauton, though they loſt the honour of giving name to Hundreds, retain'd even to Queen Elizabeth's time the privilege of ſending Bayliffs to attend the publick ſervices as the Hundreds did. Carew. p. 86.

Hides,

Hides, in Carew, (p. 47.) ſaid to contain 120 Acres; i. e. Corniſh Acres. This was the ancient diviſion, probably made by Alfred the Great, who is ſaid firſt to have divided the Saxon Kingdom into Hundreds.

Cornwall is at preſent divided into nine Hundreds; Eaſt, Weſt, Poudre, and Kerrier ſpread the South Coaſt; Stratton[1], Lyſnewyth, Trig, Pidre, and Penwith the North. When this preſent Diviſion was firſt introduced has not occurred to me, but it certainly exiſted before the Lincoln Taxation, A. D. 1288, the parochial Churches being therein rang'd according to the preſent Hundreds; I am apt to think therefore, that a new Diviſion took place ſoon after the Norman Conqueſt, the former Diviſions appearing by the Surveys of William the Firſt, to be not ſufficiently diſtinct; for about this time, ſays Mr. Carew, [m] "the country was ſorted by a "more orderly manner into pariſhes, and every pariſh committed "to a ſpiritual father;" perhaps there was then alſo, if we may gueſs by analogy, a more orderly diviſion of the county into the preſent Hundreds; the large ones were reduced and ſplit, and the names of ancient Manors gave place to other names more expreſſive of the ſituation, or at that time better entitled to give name to the diſtrict.

It is not eaſy to diſcover the limits of the ancient Diviſion, and to reconcile it to the preſent. Conarton (it may be aſſerted with great probability) included the preſent Hundred of Penwith; for the Lord of the Manor of Conarton, has been Lord alſo of all the Hundred of Penwith from the time of Henry III. (ſee note [f] in the preceding page) and there is but one Court Leet held for both the Honours, which implies ſome more than ordinary union. Among the reſt there is not the like connexion; but what was anciently call'd Tibeſta included, as I imagine, the Hundred of Poudre: Winnenton, Kerrrier: Stratton, formerly extenſive, makes at preſent the three ſmall Hundreds of Stratton, Lyſnewith, and Trig: Fauiton contained the Hundred of Eaſt, as I ſuppoſe, and the ſouthern part of Weſt Hundred: Rialton moſt part of Pidre: and Pauton the reſt of Pidre, and of the Hundred of Weſt.

In the nine Hundreds are contained, according to Camden and Speed, (p. 21.) one hundred and ſixty one Pariſh Churches; according to others about one hundred and eighty; but Martin in his Index Villaris, one hundred and ninety eight: ſome reckoning the Chapels of Eaſe and their Appendixes, others only the Mother Churches.

[1] In the Lincoln Viſitation the two Hundreds of Stratton and Lyſnewyth are joined together, and called Decanatus major Tergriſhire, as that now called Trig is termed Dacanatus minoris Tergriſhire. Trig ſignifies the Influx of the Sea, and from the arm of the Sea at Padſtow the diviſion of the bordering land had probably its name.

[m] Survey of Cornwall, p. 82.

The

The lateſt obſervations relating to the Latitude and Longitude of the principal head-lands of Cornwall, viz. the Lizherd point and the Land's end, do not exactly agree.

The Lizherd is reckon'd by

	Latitude.			Longitude from London.		
Dr. Halley - - - - -	49°	55m		5°	30m	
Martin - - - - - - - -	49°	45m		5°	36m	
Chart of Mount's Bay [n]	49°	53m	30″	5°	26m	
Renſhaw [o] - - - - - -	49°	47m	36″	5°	36m	

The Land's End is reckon'd by

Dr. Halley - - - - -	50°	5m		6°	7m	
Martin - - - - - - -	49°	56m		6°	6m	
Chart of Mount's Bay	49°	59m	30″	5°	55m	30″
Renſhaw [p] - - - - - -	50°	0m		5°	56m	

CHAP. II.

Of the Air, and Weather.

AS the Situation of Cornwall approaches ſo near to that of an Iſland, it muſt be ſubject to all the diſadvantages as well as reap the benefits of an Iſland-ſituation. No Air is abſolutely pure, or free from exhalations; Heat, whether it proceeds from the elemental fire of all bodies, or from the power of the Sun and Stars, is perpetually raiſing into the Atmoſphere Steams of Earth and Water; and in proportion as either of thoſe Elements prevail, the adjoining Air will be ſuitably replete with vapours; conſequently in ſmall Iſlands, and upon the Sea-coaſt, where the area of Water is ſuperiour to that of Land, the Air muſt be moiſter, (other circumſtances being equal) than in great tracks of land, and the Weather in general more ſubject to rain [q]. And ſo we find it indeed in Cornwall, where a dry Summer is a rare thing; and when other parts of England ſuffer by drought, Cornwall has ſeldom reaſon to complain: 'Tis true no rule with regard to Weather ſhall always

SECT. I. Much Rain.

[n] Publiſh'd by Dion. Williams, ſurveyor, and others.

[o] Large Chart of the Chanel from the obſervations made in an actual ſurvey, by Renſhaw and others, about the year 1741.

[p] By another Chart, ſaid to be corrected by Dr. Halley, and publiſhed in 1721, the Lizherd is in 49—58. and the Land's end in 50—6m. the Longitude not noted. In the Dictionary of Arts, &c. publiſhed in 1754, the Lizherd is plac'd in Lat. 49—50. Long. 5°—47m. all Arguments that this chief point of England's Chanel has never been deciſively laid down.

[q] For this reaſon the ſeaſons in the Orcades are reckoned to be very rainy.

obtain in any one place; and in the year 1752, which we may reckon among ſome of our moiſteſt Summers throughout England, more Rain fell at London than at Plymouth, according to an eſtimate made at both places; and in the Winter 1756, there were greater complaints of the exceſſive Rains in Eſſex and the parts about London, than in Cornwall; however, in general it is otherwiſe: but our Rains in Cornwall are rather frequent than heavy and exceſſive; and we have very ſeldom a day ſo thoroughly wet but that there is ſome intermiſſion, nor ſo cloudy but that the Sun will find a time to ſhine; the cauſe of which, I apprehend, is the hilly, narrow, ridge-like form of our County, over which the Winds make a quick, becauſe they have a ſhort paſſage, and leave not the clouds to hang long in one place, as they do where the ground is more champaign, and full of various hollows and trees to intercept and detain them.

Another reaſon why we have in Cornwall more Rain than in other parts of England, is, becauſe, for three parts in four of the year, the Wind blows from the intermediate points of the Weſt and the South, which Wind coming over a large track of the Atlantic Ocean, and conſequently fraught with much Wet, diſcharges it's Moiſture as ſoon as the current of Air, which ſupported the clouds, is diminiſhed and broke by the Cliffs and Hills. It was an Obſervation, made by our Saviour [r], that the Weſtern Winds brought Rain in Judea; and it could not be otherwiſe, becauſe of their paſſing over ſo large a tract of the Mediterranean. The South Wind, coming from the Coaſt of Africk, had the ſame effect in the Adriatick [s], and upon the Coaſt of Italy and Greece [t].

- - - - - Madidis Notus evolat alis,
Terribilem picea tectus caligine vultum;
Barba gravis nimbis, canis fluit unda capillis,
Fronte ſedent nebulæ, rorant pennæque ſinuſque.

The Eaſtern Winds, blowing in from the Euxine Sea upon the city of Conſtantinople, fill the Air with Miſts and Fogs. In all theſe inſtances the frequent Rains are the conſequences of Winds paſſing over a large tract of Water, and this may lead us to the reaſon why the Winds blow ſo much from the South Weſt in Cornwall. Certain it is, that Winds do generally blow from the Sea [u], of which the cauſe may be, that every current of Air which is produced on the Ocean, meeting with no promontories or mountains to reſtrain them, have their full range towards the oppoſite ſhores. Add to this, that the

[r] Luke xii. 54.

[s] Quo non arbiter Adriæ major. Hor. lib. i. Ode iii.

[t] Metam. lib. i. v. 262.

[u] Dr. Shaw Trav. p. 218. obſerves, that at Algiers the Winds blow generally from the Sea, from the Weſt by the North to the Eaſt.

reflec-

reflection of the Sun-beams upon the land being far ſtronger, and making the Air warmer and leſs denſe over the land, cæteris paribus, than over the ſea, the ſtreams of Air, which are ſet in motion by various cauſes on the ſurface of the ſea, muſt neceſſarily tend towards the land. Now the greateſt quantity of ſea to which England, and more particularly the Weſtern parts of it, is moſt expoſed, is the Atlantic Ocean, lying to the South Weſt of it, between the continents of Africa, Europe, and America; conſequently from this quarter the Winds muſt moſt generally blow.

SECT. II
Storms miſchievous.

Being ſo near the Sea as we are in moſt parts of Cornwall, our Stormy blaſts are more violent than in the inland parts of England, becauſe, though thoſe lands which are more remote from the Sea are for the generality much higher than thoſe upon the Sea ſhore, yet the currents of Air, which we call Winds, are ſo broken by the the hills in ſome places, and abſorb'd by valleys and woods in others, that they loſe their ſtrength, and gradually proceed into a more temperate motion, or even a flat calm, before they reach the more inland ſituations; whereas, near the Sea, they come on with their full force, without being impeded or diſſipated. Hence it is that the South Weſt Winds, which blow ſo long with us, not only bring rain, but alſo hard gales[w]; every wind that riſes advancing to the land without any obſtacle over ſo large a plane of water as the Atlantic ocean.

SECT. III.
The Cauſe of Winds ſuggeſted.

It may not be amiſs here to ſay ſomething of the Atmoſphere in general, and to hint at the cauſes from which thoſe currents of Air, which we call Winds, may poſſibly ariſe. The Atmoſphere is a congeries of Air, fiery, terrene, and moiſt vapours; the Air is the fluid medium through which the light paſſes, in which Fire is detained, into which the vapours riſe, and there float till they fall. The Air is ſeldom at reſt, being variouſly agitated, condenſed, or rarefied, by the vapours and fire intermixed. The fire may be either equally diſpers'd and ſtagnant in the Atmoſphere, ſo as to remain inviſible, or collected in one place, and from various cauſes ſuſceptible of inflammation, activity, and exploſion. The vapours riſe from Land and Sea, and are conſequently of a mixed nature; the dry parts of as different a compoſition as the Earths and Minerals, and the moiſture as differently impregnated as the Waters of the Sea, Lakes, Rivers, and Fountains. Vapours float alſo in particular ſortments, and in quantities of different magnitude, according as heat operates, and promotes their ſeparation and aſcent into the

[w] Creberque procellis Africus. VIRG.

Air,

Air. In other words, vapours are either denſe and heavy, or in a rarer ſtate; now ſpacious combinations, now ſmaller and more contracted; differently ſhap'd, their ſurfaces either ſloping or horizontal, concave at one time and convex at another. Theſe unevenneſſes of the vapourous contents of the Atmoſphere muſt diſpoſe the ſpaces of Air which lie betwixt and on every ſide of them into equal irregularities; ſometimes into narrow guts and ſtraits, ſometimes into wider and more extended chanels; now perhaps ſome hundreds of leagues long, and ſometimes not a mile; here a tall column of Air depends, there it is compreſſed into a ſpreading oblate diſk, all cauſed by the different ſizes, ſhapes, and ſubſtance of the Clouds and Vapours, and making the Atmoſphere ſomewhat like Earth which it inveſts, full, if I may ſo expreſs myſelf, of fleeting mountains, hills, plains, valleys, ſtraits, and expanſes. This is the general form of the Atmoſphere; and were it poſſible for the human eye to comprehend this extenſive proſpect, and to note the ſucceſſive alterations made in the Air by repletion and vacuity, by heat and cold, we ſhould be no more ſurpriſed to ſee ſuch a multifarious fluid perpetually in motion, reſiſted, protruded, condenſed, expanded, retarded, or accelerated, in its different parts, than we are to obſerve the various eddies, torrents, ſwift ſtreams, and ſtiller pools of a large river. For inſtance, in the latter caſe, if we ſee the current ſtrong and ſwift, we attribute the velocity to the narrowing or ſhelving chanel, or perhaps to the additional influx of extraordinary Rain or Snow; but if we find it impetuous and irreſiſtible, we conclude the banks have given way, and the Water, ſtruggling to deſcend, ruſhes to that place where there is leaſt reſiſtance. As theſe are the cauſes of direct ſtreams and their different velocities, the oppoſition of little iſlands and projecting banks in a river are the cauſes of delayed and crooked currents. In like manner, the ſpaces between the floating vapours are ſo many chanels through which the Air paſſes, ever ſtruggling to maintain an equilibrium, and tending to any ſpace which is leſs replete in one part than in another. Wind is nothing more than Air in motion; rarefactions and vacuities in the Atmoſphere are the immediate cauſes of this motion, and are produced frequently, we may ſay continually, by ſeveral different cauſes. The Sun, by concurrent circumſtances in land, water, and vapour, lightens and diſperſes the Air from one place, and at one time, more than at another. Inflammable exhalations and their exploſions ſhall warm and thin the Air in particular places. A cloud or portion of Vapour full of electrical matter, paſſing near a cloud or region of land more deſtitute of electrical matter, will ſhed ſtreams of fire upon the leſs electric body, and thereby excite violent motions.

Great

Great falls of Rain and Dew ſhall make way for the Air to expand, become rarer, and cauſe an indraught of that which is heavier. Condenſations of the Air in one place will ſometimes produce rarity in another; a body of Vapours may intercept and obſtruct the communication of the ſeveral airy parts of the Atmoſphere, and conſequently prevent an equilibrium. Now, where-ever the Air is thrown into a ſtate of rarefaction, there a vacuity is produced, and the adjacent Air flows as Water to the breach of a dam, and the flood is either violent or not, as the ſpace through which it paſſes is ſhaped, laſting as the quantity of the fluid ſet in motion, and as the extent of the vacuity is, which is to be repleniſhed. If the vacuity be ſpacious, the flow will be plentiful; (obſtructions in the way being allowed for) if the chanel through which the influx runs be long, narrow, and funnel-like, the velocity will be great, and vice versâ; but if a large quantity of condenſed Air chances at this time to preſs forward towards this large vacuity, the motion of the Air will be impetuous, or what we call a Storm. If, on the other hand, the rarefactions in particular diſtricts be gentle, and there is room for denſer Air to ſucceed without violence, the motion alſo is gentle; and where no extraordinary rarefactions are produced, and the Vapours are equally diſperſed, a Calm enſues. If the Vapours aſſume the ſhape of an oblate diſk, overſpreading as a canopy a wide extent, the weight and continuity of the incumbent Air is in this diſtrict for a time, and to a certain degree, ſuſpended, the Mercury ſinks in the Barometer, and at the ſame time the current of the Air above this diſk ſhall go one way, towards any vacuity which ſhall create a freſh tendency, and the under current of Air, influenced by another rarefaction, ſhall go on in a different, perhaps oppoſite direction, there being no communication betwixt the currents above and below the diſk of vapours, ſufficient to determine them to one point. Thus again, by the fall or even the receſs of a great body of vapours in one place out of our ſight, the air over our heads before condens'd, and keeping the Mercury high, extends itſelf into the vacuity; the wind blows, as we ſay, and the Mercury falls in a ſerene ſky to our ſurprize. By the riſing of a like body of vapours, and accumulating the air of our horizon, the Mercury riſes in a cloudy and even rainy ſky. When the Wind is violent, the perpendicular preſſure of the air is much leſſened by the velocity of the horizontal proceſs (as a wheel that runs ſwiftly makes not ſo deep an impreſſion as when ſlowly moved) and the Mercury falls. When the air is fulleſt of vapours, the Mercury falls, the preſſure of the atmoſphere depending not only on the weight of the fluid, but on the agility, and elaſticity of the column of air which is broken and intercepted by ſuch a quantity of moiſture floating between, condenſing and

ready to fall. Theſe and many other variations which might be mentioned, are the neceſſary reſult of meteors, vapours, and air intermixed in ſeparate portions, and acting with reciprocal, but generally very different powers; however, between the Tropics theſe varieties are over-rul'd, and ſuperceded by the inceſſant heat of the ſun, which produces regular, or trade-winds: but to finiſh this excurſion and return, I am not here to attempt a Theory of the regular and irregular Winds; let it ſuffice, that the cauſes of Winds in general, and their ſeveral velocities, may be very rationally attributed to the riſe and fluctuation of vapours, the ſhape and ſize which their combinations aſſume in the firmament, and the different condenſations and rarefactions of the air.

SECT. IV. Bad effects of Sea Air.

The air of Cornwall muſt needs partake of the ſalts of the ſea adjoining, in a great degree, and therefore corrodes iron in a very ſhort time, and near the ſea, more than in the inland parts; the bars and frames of windows, and every thing elſe made of iron, preſently giving way to the ſalt ſpray, let them be painted ever ſo well. This ſaltneſs of the air is alſo very unfavourable to ſcorbutic habits; the ſea-vapour not being ſufficiently corrected by a proper quantity of effluvia from the land. It is alſo very prejudicial to ſhrubs and trees; and near the ſea ſhores, eſpecially towards the Weſt, whether mix'd with the North or South winds, will permit a tree to riſe very little above it's ſhelter, which is very diſcouraging to all new plantations. Indeed there is reaſon to think, that vapours in general, rais'd from the land and dropping in rains, are much more nouriſhing to plants than thoſe exhal'd from the ſea. For vapours from the land are charg'd with the particles of the ſoil they riſe from, and ſupply the plants and trees, wherever they fall, with a kindly juice, mix'd with freſh and new earth; and this is the reaſon that the more water is diſtill'd (that is, forc'd to depoſit it's terrene fæces) the leſs it nouriſhes plants: now vapours rais'd from the ſea can be no other than ſtrain'd or diſtill'd ſalt water, and therefore cannot be ſo fit for vegetation, which is confirm'd alſo by this obſervation, that moſt trees thrive better at a little diſtance from the ſea, than near it's brink.

This Sea-air is pernicious to plants in proportion to their tender, or robuſt nature, and the force with which it is driven upon them; for after a ſtorm we uſually find the young ſhoots of plants ſhrivell'd, according as they were more or leſs expos'd, and to the taſt of a very pungent ſaltneſs: the fibres are firſt bruiſed by the violent guſts of wind, and the ſalt air coming in quick ſucceſſion, inſinuates itſelf into the wound, ſcorches the ſap veſſels, and

vegetation

vegetation is at a ſtand till the tone of the veſſels is reſtored. Under ſhelters, and at a few miles diſtance from the ſea, trees ſuffer leſs; but all, I think, in ſome degree, as they ſhew by leaning from the ſea winds; ſo that without great induſtry in raiſing ſhelters, and great attention to the care and repair of them when rais'd, we are not likely to ſee our hills planted, nor hedge-rows of tall trees make a figure in Cornwall, as they do in ſome counties, though farther from the ſun, becauſe leſs expoſed to the ſea blaſts.

SECT. V. Seaſons mild.

Our winters in Cornwall are far milder than in any part of England: Myrtles, of whatever kind, are in no want of green-houſes, and if now and then, through the ſeverity of an extra-ordinary cold ſeaſon, their upper ſhoots are killed by the froſt, cut them off near to the ground, and they will ſprout plentifully in the ſucceeding ſpring, and make as good plants as they were before. We have no ſhowers of exceſſive large hail in Cornwall, as they have in the inland parts, and ſnow ſeldom lies more than three or four days, which is to be attributed partly to our ſea-air, which yields not nitre and other ſharp ſalts, in ſufficient quantity to make our froſts and congelations in the atmoſphere extreme and laſting, and partly, but in leſs degree, to our latitude, which is the ſouthernmoſt of all England. However, when the winters are more than uſually cold in other parts of the Iſland, Cornwall feels it in proportion to it's climate and marine ſituation. In the year 1739, at Chriſtmas began a moſt violent cold, after two or three days of bluſtering North Eaſt Winds: on the 29th of December it froze very hard, the next day it began to ſnow, and the windows of my little greenhouſe being accidentally open, the Orange trees and Jeſſamines were killed to the very roots by the next morning; the extremity of the weather laſted a full month, and the ſnow lay in ſome corners of the fields full two months; but ſuch winters are ſeldom known in Cornwall. In the year 1755, the Mercury in Farenheit's Thermometer was not under forty degrees. In the year 1756, not lower than thirty nine, which was December the thirty firſt, in hard froſt.

As our winters are uſually mild, our Spring for the ſame reaſon ſhews itſelf early in buds and bloſſoms, but I think it's progreſs is not ſo quick as elſewhere; for as there is a languid kind of Spring throughout the winter, (chiefly, indeed, in the ſunny ſouthern lands) the ſpring ſeaſon cannot be ſaid to be ſo early in other counties as in Cornwall; but when the winter is over, and the Spring begins in other mediterranean counties, I apprehend, it makes much ſtronger efforts, and quicker advances, than with us; the repoſe of the winter,

winter, in ſuch counties, imparting to vegetation a vigorous ſpring, unknown to the equable ſeaſons of Cornwall. In ſhort, the ſeaſons with us in Cornwall, are like the Neap-tides, they neither ebb nor flow with any great energy: the heat of the atmoſphere neither retires ſo far from us in winter, nor advances to that height in ſummer, as it does in the more inland counties: conſequently, our ſummers, though we lie ſo far to the ſouth, are not hot; for there is always a ſea breeze flowing towards the land, and the air of the ſea is never ſo hot, cæteris paribus, as the air of the land; becauſe the ſtrong reflection of the ſun beams from the land almoſt doubles the heat; the ſun beams are alſo detain'd in the vales and hollows, in the midland parts, (circumſtances not common to the ſea and ſea, coaſts) which have the ſame effect upon the air (though in a leſs degree) as concave mirrors, always heating, though not always burning: It is much hotter therefore in the midland parts of England, during the ſummer, than in Cornwall; this may make their harveſts earlier, and their fruits generally of a higher reliſh than with us, (in equal circumſtances, I mean, as to drought and moiſture, ſterility and fatneſs) but the air is more temperate and leſs ſultry with us, the ſea air equally aſſwaging the heats of ſummer, and moderating the winter colds.

Eſt ubi plus tepeant Hyemes? ubi gratior aura
Leniat et rabiem Canis, et momenta Leonis?

HOR. Epiſt. lib. i.

SECT. VI. Meteors and Lightning.

As there are ſo many mines in Cornwall, and moſt of them yield ſulphur, vitriol, mundic, and goſſan [x], they cannot but affect the air with their ſteams in proportion to the quantity yielded by the mine, and the facility with which their parts ſeparate and aſcend into the Atmoſphere. Theſe mineral vapours aſcend ſo copiouſly out of ſome of our Lodes or veins of metal, and conſiſt of ſuch inflammable parts as to take fire, and appear in flame over the Lodes from which they riſe, and it is a common opinion among Tinners, eſpecially thoſe of more than ordinary ſpeculation, that where little flames of light are ſeen in the night time, there a proſperous Lode lies underneath, but indeed the lights which are ſeen in the night are much oftner ignes fatui [y], and have nothing to inform us of, but that being deſerted by the ſun that rais'd them, their own weight confines them to their low ſituation, where they yield their electrical fire, and will always do ſo, whenever proper motion and materials concur.

[x] An iron, ochreous, ſtony clay.

[y] Called by the Corniſh, Jack with the Lanthorn.

On

On the 20th of December 1752, about eight in the morning, the ſky was on a ſudden overcaſt with dark-red angry clouds; the wind very boiſterous; at intervals a blue ſky, then large clouds with cold ſhowers: about a quarter before twelve neither rain nor wind, but ſunſhine; ſome flying thin clouds were obſerved to join, and one of the moſt ſhocking peals of Thunder enſued. The Lightning fell with greateſt violence upon a hill called Moelfra, in the pariſh of Maddern, where it pierced banks like a dart, furrowed the ground as if it had been a plough-ſhare, cut off flat turves, burſt rocks, ſplit them into ſhivers, fell on ſome particular ſpots of the rocks, and ſplintered them as if muſket balls: it rooted up ſome ſtones, and made its way clear under others, ſhewing the traces of its paſſage on both ſides. The whole workings of the Lightning in this hill (than which there is no higher land betwixt the North and South Sea) were in length about a furlong from Eaſt to Weſt; and there was a ſmoke ſeen in this part of the hill, as if ſeveral Muſkets had been diſcharged: at the Thunder, the ſheep diſperſed and ran to and fro, as if purſued by a pack of dogs. At Trythâl, a village without tree or hill near it, about a mile and half South Weſt of Moelfra, this clap of Thunder was ſo violent that nothing was remembered equal to it; but the effects of what followed in a few minutes were ſtill more dreadful, and of the moſt deplorable kind. "Thomas Olivey[z], a farmer of good ſubſtance and repute, was returned from the field about a quarter before noon, and had all his family round him in the kitchen, except his daughter, who was in the hall. There was a braſs pan over the fire in the kitchen chimney nearly full of boiling water; the farmer was ſitting by the fire, his wife on a bench before it, their only ſon, 23 years of age, was ſtanding at the window; the farmer finding the Thunder and Lightning before-mentioned ſo violent that the back-door of his kitchen, facing the North, quivered, called to his ſon, and deſired him not to ſtand ſo near the window, leaſt the Lightning ſhould hurt his Eyes, upon which the young man removed from the window backwards into the corner of the room, and ſat down, as he thought, in a place of greater ſecurity; for this, the apprentice boy laughing at him, was chid by his maſter, and, luckily for him, ſent out of the room to take care of ſomething without doors. Immediately the Lightning came from the W. N. W. and falling upon the ſtack of the kitchen chimney, which was about four foot ſquare, and as much in height, of hewn ſtone, carried it clear off from the houſe, and threw it into a pool of water 20 feet diſtant. In the chamber over the kitchen there was a little cloſet boarded in, which ſtood juſt under the top

[z] Theſe circumſtances were laid before the Royal Society by the author, and are publiſhed in the Tranſactions of the year 1753.

of the chimney where the Lightning firſt fell; all the boards were broken to pieces, the bedſtead and the timbers of the roof ſhattered: of the chamber partition two planks were forced, a large preſs for holding cloaths thrown down, and the ſouth windows of the chamber floor (except one caſement) all broken and blown out. From the top of the chimney and the chamber floor it deſcended vertically into the kitchen below, where the family was. The farmer ſaw no Lightning, nor heard any Thunder, being ſtruck ſenſeleſs with the firſt flaſh, and thrown into the middle of the kitchen, where he continued ſenſeleſs for a quarter of an hour. As ſoon as he came to himſelf, he aſked, Who ſtruck him? but had not the uſe of his arms, and felt an aching pain ſhooting, as he deſcribed it, into his bones; and a brand-iron, which hung in the chimney, being thrown down into the pan of water, had daſhed the boiling water upon him to that degree, that his life was in extreme danger for more than a fortnight after. Mrs. Olivey was ſtruck down upon the hearth; both her ſhoes, though buckled on as uſual, were ſtruck off her feet, but her feet not hurt; and being neither burnt nor ſenſeleſs, ſhe was able to cry out for help, but could not move; for ſhe had no uſe of her under limbs for a day and half: the farmer's brother was at the end of a long table in the ſame room, and was only flung againſt the wall about three feet diſtant, and not hurt. Mrs. Olivey's ſiſter was near the back-door; a part of this door was ſtarted and beaten in, ſhe was ſtruck ſenſeleſs, and thrown twelve feet off againſt a ſettle, which ſtood contiguous to the ſouth wall of the houſe. The farmer's ſon had ſeated himſelf according to his father's directions, but unhappily in the very courſe of the fierceſt Ligthning; his coat and waiſtcoats (for he had two on) were torn into ſhreds, ſo that it was difficult to diſtinguiſh where the pieces had formerly joined; his ſhirt had a rent two feet long down the back, and was ſinged; his left ſhoe torn from his foot; and the little toe of that foot ſo near cut off, that it hung but by a bit of ſkin; and he was quite dead: but though reduced to this lamentable condition, as to his exteriour, he was not moved from his ſeat, nor his face at all changed. His dog was lying at his feet, dead likewiſe; but not moved from his place.

The farmer's daughter received the ſhock in the hall, was ſtruck ſenſeleſs, but revived ſoon; felt a trembling all over, her feet tickling, partly benumbed, and ſtiff, as if ſleeping; but perceiving in the room a cloud of ſmoke, and hearing her mother cry, ſhe made haſte into the kitchen, which ſhe found full of ſmoke, ſtinking like brimſtone. The Lightning had left a mark quite acroſs the clavel of the kitchen chimney, about half an inch wide, in an undulating direction, broke through the partitions of the under floor, thrown down

down the ſhelves, carried out all the ſouth windows, forced up the ſtair-caſe, blown out the north window, but ſpared the clock, which ſtood cloſe by it; and being ſomewhat ſpent when it reached the hall, carried out the windows, and moved not ſome Delft baſons which were in the ſouth window, forced the door of a beaufet at the end of the hall an inch and half inwards, and ſhook the eaſtern wall of the houſe throughout to the very foundation."

Though it might be ſufficient here to relate the matters of fact in the order of time, place, and degree, as they happened, yet one cannot help admiring the different currents, motions, ſhapes, and deſolations of this Lightning. The clouds over Moelfra hill and this village of Trythâl, a ſpace of about a mile and half, were ſo much more charged with inflammable vapours than the other clouds, that here they broke both the firſt and ſecond time, with ſuperior violence, and the Thunder-claps were within a few minutes of one another, as being produced but by two portions of one and the ſame congeries of fire.

The general tendency of this Lightning was as the direction of the wind at that time; that is, from the North Weſt Eaſtwardly; but where the principal exploſions were (as at the hill and the houſe) many branches ſpread themſelves off in all directions.

Nor were the ſhapes in which it operated leſs various than its motions; ſometimes, as from its effects appeared, it was pointed as a dart, in ſome places edged as a ſcythe; now but one thin ſheet or ſtream, then two or three, and afterwards one again; now it fell as ſeveral ſeparate balls of fire; but upon the houſe, where the principal exploſion was, as a large guſh or torrent.

It was all fire, yet of different powers, according to the impregnation of its ſeveral portions: ſubtil and penetrating as the electrical fire, it ſhocked and permeated the human frame; ſome parts of it only ſcorched wood, never melted iron, which is the more common effect of the two; ſome tore the leather and cloaths, ſome cut and wounded, and ſome killed, without viſible cut or puncture; other parts of this Lightning again, upon ſtone, wood, leather, cloaths, and fleſh, only diſcoloured, ruſhed, and forced, with the power of infected air put into a violent fermentation.

All this happened in this place, and all in an inſtant; and altho' the cloaths were ſomewhat ſinged as well as torn, and the young man's ſkin round his waiſt was alſo ſcorched, yet from the general effects of this Lightning at the hill and village, I conclude, that it was rather ſwift and irreſiſtibly piercing, than diſſolvent and inflammatory.

This happened in the winter month of December, but the ravages of Lightning are not limited to a ſeaſon.

On

On Tueſday, Auguſt 2, 1757, between one and two of the clock, as James Tillie, Eſq; of Pentillie caſtle, in Cornwall, with his neighbours and ſervants, were lying aground in a boat on a ſand-bank in the river Tamar, not half a mile from his own houſe, waiting the tide to throw a net for ſalmon, a ſudden clap of Thunder broke over their heads. In a field adjoining the graſs ſeemed on fire and the whole field in a flame, and a fire-ball was obſerved juſt to paſs over the hedge at the top of a very ſteep wood which hangs over the Tamar. The fire-ball fell on the boat; and paſſing from the South-Weſt in a direct line from the larboard bow to the ſtern, James Widear, Mr. Tillie's ſervant, in the bow, had a violent blow on his right ſhoulder and head; Mr. Samble, who ſat next to him, was ſtruck deaf for ſome time; Mr. Tillie ſat next in the middle of the boat, and plainly perceived the fire-ball, about five inches diameter, ſomewhat ſharp, and pointed in the fore-part, to paſs by him at about three feet diſtance [a]: he was violently ſtruck on the back part of his head by the current of the air attending the ball; his eyes were ſhut, and he leaped from his ſeat about two or three feet high; and on the return of his ſenſes, opening his eyes, was ſurprized to find himſelf ſtanding; for before the ſhock he was ſitting on the oar. The right ſide of his face continued very warm for two hours, and the corner of his hat was carried away, as if half of a ſmall bullet had been ſhot through it. Robert Atkins, a ſervant of Mr. Tillie, was near the ſtern, with his face to the South-Weſt, but not in the direct line of the fire-ball: he was ſtruck ſpeechleſs, thrown on his back upon the fiſhing-net, remained inſenſible for two or three hours afterwards, his face was black, as if the priming of a gun had been blown by accident over it; his left eye weak, and contracted for a fortnight after; with a great numbneſs in all his limbs, until a briſk circulation of the blood enſued, and then he had violent pains, which wore off ſlowly, leaving him weak and low, with complaints of frequent head-ach, but no viſible mark of hurt. Mr. Pethen, a tenant of Mr. Tillie, was ſtanding three feet from Atkins, upon the ſeat of the ſtern, with his face to the South Weſt, and had ſcarce done ſpeaking when the fire-ball fell on his left temple, and ſtruck him dead into the river. He was immediately taken up by ſome of Mr. Tillie's ſervants on the ſhore. His peruke on fire, and ſmoaking in the ſtern of the boat, Mr. Tillie took up and extinguiſhed: it had a hole burnt in it as large as a crown piece, and ſmelt ſtrongly of ſulphur. His hat was blown into the water, rent three or four inches long, the lining only ript. His cloaths were but little rent: on his hip there was a black ſcar about three or four inches long, and diſcoloured as if filled with

[a] Letter from James Tillie, Eſq; to the author.

colour;

gunpowder: his neck and left breaſt were ſoon after his death changed to a claret colour; but where the fire-ball fell, it left no wound more viſible than the puncture of a pin, neither did it diſcolour his temple; but the third day the lower part of his face altered a little, and the other parts of his body became diſcoloured more and more, till his burial. All his cloaths ſmelt like gunpowder newly diſcharged. There were three perſons ſtanding on the adjoining ſand; one was violently ſtruck on the head, the ſecond had his eye ſinged, and the fire-ball fell between the legs of the third into the ſand, from whence he only perceived a ſudden warmth. The day had been ſhowry, neither hot nor cold; and the ſun ſhone, though faintly, about ten minutes before the exploſion. No one had his face turn'd towards the South-Weſt but Mr. Pethen and R. Atkins.

SECT. VII. Air healthy.

Having mentioned the exceſſes to which the air of this County is ſubject, I cannot but obſerve, that, notwithſtanding this, the air is very healthy. Though we have frequent rains, the air is by no means rendered thereby leſs fit for reſpiration: it is not charged with the ſluggiſh exhalations of bogs, marſhes, or ſtagnating pools among thick woods; nor do there many flat calms happen; and when they do, they ſeldom continue for the ſpace of a day; for either the ſea breezes interpoſe, or the numerous promontories[b], by oppoſing and collecting every current of air, promote a conſtant flow of wind one way or other round their extremities, ſo as that miſts ſeldom reſt long. Neither can the ſaltneſs of the air, nor the mineral exhalations, be ſaid to make the air ſickly, as many inſtances of long life (as will appear in the following ſheets) being to be found here as in any part of England, ſo happily do theſe ſeeming extremes correct and qualify one another, and by a mixture, of which we know not the limits and proportion, rectify and keep the air in a wholſome temperature.

SECT. VIII. Weather ſigns.

The huſbandmen and fiſhermen here have many ſigns of the enſuing alterations of the weather, as thoſe, whoſe daily employments are in the open air, have, by experience, learned in all places; but one appeared new and ſingular to me. Saturday, Auguſt 15, 1752, the wind at Weſt North Weſt, the ſky cloudy, the Mercury moving upwards in the Barometer, about ſix in the evening, there appeared in the North-Eaſt the fruſtum of a large rainbow; all the colours were very lively and diſtinct, and it was three times as wide as the arch of an ordinary complete Rainbow, but no higher than it was wide. They call it here in Cornwall a weather dog; but in

[b] So many, that they are thought to give the Britiſh name of Kernou, (ſignifying horns, or headlands) to this County, whence the more modern names of Cornwall, Cornubia, Cornugallia, &c.

the Corniſh tongue, Lagas-auel; that is, the weather's eye; and pronounce it a certain ſign of hard rain. Notwithſtanding this, the Mercury fell only two tenths of an inch, and on Saturday night there was no rain. Sunday morning was dry, but not clear; and about eleven it began to rain gently, about one, poſt merid. a flood of rain came on, and continued all Sunday night, and till ten the next morning.

SECT. IX. Inconſtant, as to Rain and Wind.

The conjunctions and oppoſitions of the Sun and Moon would have a regular effect upon the Atmoſphere of the Earth, and conſequently influence the wind and rain in a regular manner at periodical diſtances of time, if the Atmoſphere was always in one fixed equal temperature. This we ſee plainly demonſtrated in a thicker medium, by the regular influence of the Sun and moon upon the Ocean, where the tides riſe and fall as the Moon is perpendicular or oblique, in its meridian or decline, and vary generally, though not exactly, according as the Sun and Moon act in concert or oppoſition; but the Atmoſphere is a much more mixed and complicated body, as well as much eaſier diſturb'd, than the waters; and in proportion as the ſeveral airy, aqueous, ſaline, or ſulphureous exhalations prevail at any time, and in any place, the alterations which would otherwiſe regularly follow the poſitions of the Sun, Moon, and Earth, are ſuſpended and controuled, and oftentimes totally prevented, and the quite contrary effect produced, by the more powerful, though fluctuating and uncertain, combinations of the parts of the Atmoſphere.

The weather is therefore inconſtant every-where, but in ſome places more ſo than in others. In hot countries it is more inconſtant, and the alterations more violent, cæteris paribus, than in cold. In the Torrid Zone there are more tornadoes and hurricanes than in the Temperate Zone; more inconſtancy of weather again in the temperate than within and near the Polar Circle, where by reaſon that the Air is more condenſed, and the Atmoſphere ſuffers leſs alteration from the Sun's influence and the variety of vapours that attend it, the weather is much more uniform, clear, and equable, than in warmer climates. In Cornwall it may be reckoned in general as unſettled and various, as to wind and rain, as any-where in Britain, ſuch ſudden tranſitions there are from wet to dry, and from calm to tempeſt. One of the greateſt variations which I have obſerved in the Mercury of the Barometer, was April 3, 1753; when, from Tueſday nine o' clock in the evening, to Wedneſday ten o'clock in the morning, the Mercury fell $\frac{77}{100}$ parts of an inch, the Mercury reſting at 28 $\frac{3}{100}$, which is the loweſt I have ever yet noted. It then blew a ſtorm, with ſome ſhowers of hail and rain;

and

and the vacuity of the Atmoſphere, which occaſioned this great ſubſidence of the Mercury, drawing after it a guſt of air, the Mercury began to riſe at one o' clock, poſt merid. and by ten at night was riſen $\frac{58}{100}$ parts of an inch. During all this month the greateſt variation at London in one day was but $\frac{40}{100}$ parts of an inch. A more ſurpriſing variation ſtill happened on Wedneſday, February 18, 1756: the morning very dark, Wind at North Eaſt, it ſnowed hard, and the wind blew a hurricane all the forenoon; my Diagonal Barometer continued at 28---84: next morning, the Wind at North, cold Hail, and then Sunſhine, the Mercury was riſen to 29---84; a very extraordinary riſe for ſo ſhort a time. At Liſkerd about 60 miles to the Eaſtward of my houſe, from Wedneſday February 18, 1756, 12 at noon, to Thurſday 19 at noon, (viz. in 24 hours) the quickſilver roſe one inch $\frac{13}{100}$[e]. By this violent and ſudden alteration in the Mercury it appears that the Atmoſphere at theſe times muſt have been greatly agitated, and proceeded over the earth in vaſt waves; low, deep, and hollow, when the Mercury fell; lofty and mountainous afterwards, which occaſioned as ſudden a riſe. This deſultory ſtate of the Atmoſphere will alſo account for and confirm the common obſervation, that when the Mercury riſes or falls quick, it is a certain ſign of a ſhort continuance of fair or foul weather: the fluids over our head are agitated in like manner as thoſe of the ocean, but, as being a thinner medium, much ſooner, eaſier, and by leſs force; and when the column of air over any place is ſuddenly and greatly encreaſed, that height muſt be quickly followed by a depreſſion of the next ſucceeding portion of the Atmoſphere, as ſurely as an elevated wave of the ſea leaves a hollow to come after it: but when the Mercury riſes or falls gradually, or continues ſtationary, then the Atmoſphere being of a plain ſurface, little agitated, the column of air is nearly the ſame, and the weather is likely to continue for ſome time.

SECT. X. Heat and cold more equable.

But though our weather, as to wind and rain, is ſo inconſtant, yet as to heat and cold it is much more conſtant and ſettled than in the Eaſtern parts of England. Six ſeveral days in July, 1756, Farenheit's Mercurial Thermometer altered only one degree; two degrees nine days; three degrees ſeven days; four degrees three days; five degrees one day; and on five days there was no variation: but the Thermometer at London on two days altered one degree; two degrees on two days; three degrees on ſix days; four degrees on four days; five degrees on three days; ſix degrees

[e] At London, if I am rightly informed, the riſe was ſtill more precipitate; the Barometer at the Royal Society was on this Wedneſday but fourteen hours riſing one full inch.

on

on four days; ſeven degrees on five days; eight degrees on three days; nine degrees on one day; and one day it varied twelve degrees; viz.[d] on the 22d of July: whereas on the ſame day it varied with me at Ludgvan but four degrees.

From the following table it will appear how much greater the variation of the Thermometer was at London than in Cornwall in the Summer, Autumn, and ſpring months, 1756 and 1757.

Variation of Farenheit's Mercurial Thermometer.

JULY 1756.

In Cornwall.		In London.	
Degrees.	Days.	Degrees.	Days.
1 } It altered.	6 }	1 }	2 }
2	9	2	2
3	7	3	6
4	3	4	4
5	1	5	3
No variation	5	6	4
		7	5
		8	3
		9	1
		12	1

It altered.

OCTOBER 1756.

In Cornwall.		In London.	
Degrees.	Days.	Degrees.	Days.
1 } It altered.	13 }	1 }	4 }
2	7	2	9
2	1	3	4
3	5	4	7
4	1	5	3
No variation	4	6	3
		7	1

It altered.

MARCH 1757.

In Cornwall.		In London.	
Degrees.	Days.	Degrees.	Days.
1 } It altered.	10 }	1 }	1 }
2	3	2	5
3	8	3	7
4	1	4	9
No variation	4	5	2
Higher in the Morning than at Night	5	6	2
		7	2
		10	2
		0	1

It altered.

The ſeveral degrees multiplied by the days will ſhew the difference. The reaſon of this greater variation of the Thermometer at London than in Cornwall is, chiefly, that the reflection of the ſunbeams from a tract of land which has no large portion of the ſea near it, makes it hotter at noon, and conſequently the quickſilver riſes higher than in Cornwall and in ſmall iſlands, where there being a greater quantity of ſea than of land, they want this additional heat and the quickſilver riſes but a ſmall matter; on the other hand the ceaſing of this reflection in the inland-parts by the coming on of night, makes the Mercury ſink in proportion; whereas in Cornwall, as the noon is not hot, the night varies not ſo much from the day, eſpecially if the day be cloudy, when I find the Mercury at eight or nine o'clock p. m. almoſt as high as at noon, and the general difference at a medium, but one degree. The greateſt difference in the height of the Mercury in Cornwall therefore, is between eight at night and four or five in the morning.

It may not be amiſs here to obſerve how different the weather is now and then in climates not very diſtant: In the year 1751 we had a very rainy ſummer throughout England, ſcarce two days paſſing without frequent ſhowers, and the Mercury in the Barometer very unſettled; in three days ſpace varying generally $\frac{30}{100}$ parts of an inch. At the ſame time, in Italy prevailed an extraordinary drought; the accounts from Parma, dated July 17, running thus, "Publick prayers are ſtill continued in all our

[d] According to the account publiſhed at London of Mr. Ayſcough's obſervations.

churches,

churches, in order to implore the Almighty to ſend down ſome ſhowers of rain to refreſh the fruits of the earth, which are already greatly damaged by the exceſſive drought which has raged here for a conſiderable time:" which ſhews that as inconſtant as the weather and winds may be, the Atmoſphere may be overloaded with moiſture in one place, and greatly deſtitute for ſome months together in another place not very diſtant; the plenty of rain here, it ſeems, had made a ſcarcity in Italy, and there cannot be a redundancy in one climate without occaſioning the reverſe in another: one determined quantity of moiſture is indeed allotted by the great diſtributor of all things, who created his bleſſings by ſcale and meaſure; but he delivers them out to us in plenty or ſcarcity, as it ſeems good to him either to proſper or correct us; parſimonious and retentive as it may appear to us at firſt ſight, to one part, over-liberal to another, but really juſt, gracious, and invariably beneficent to the whole.

CHAP. III.

Of Waters in general, and thoſe of Cornwall in particular.

SECT. I. WATER however attenuated or diſguiſed, is Water ſtill, and it's particles unalterable though of the moſt moveable kind; conſequently, all quantities of this liquor, from the ocean down to the moſt rarefied vapour, are equally Water, and will require ſome notice to be taken of them in this place. Water therefore includes Vapour, Dew, Damps, Springs, Rain, Brook, River, Lake, and Sea.

SECT. II. Water in general.

As Air is neceſſary every minute to give ſpring and motion to the ſolids as well as fluids of all bodies, ſo is Water to renew the liquids, which are perpetually ſhifting their place, and without conſtant ſupplies would leave the ſolids they depart from, meer duſt. Water is therefore diſperſed throughout the univerſe, in order to maintain the coherence of all bodies, ſupply waſte, and prevent the aſcendency of Fire, which without Water to oppoſe and qualify it, would parch and reduce all bodies to a calx, to aſhes, or cinders.

Particles of Water are generally allowed to be round as to figure. This figure indeed is not to be demonſtrated, but is inferred from its fluidity. Allowing then the figure of watry particles to be round, fluidity muſt be an eſſential property of all quantities and aſſemblages of theſe particles[c]; for take any maſs of round bodies,

[c] Not the effect of fire as ſome philoſophers have lately held.

(bullets for inſtance, pebbles, or the like) they will not cohere nor reſt by one the other without force, but will flow on every ſide, till they meet with ſuch reſiſtance from external bodies, or their internal gravitation as ſhall prevent farther motion.

The particles of Water are unalterable; for, paſſing into ſo many bodies, and through ſuch alternate extremes of heat and cold, if they had not conſtantly preſerv'd their eſſential properties, moiſture, ſince the beginning of the world, muſt have ſenſibly diminiſhed; but ſeeing no ſuch deficiency appears, and that ſprings, rains, and rivers are as abundant now as they anciently were (as by the obſervations on the riſing of the Nile for many ages, among other reaſons may appear) we are to conclude, that though Waters may be tranſplanted, they can neither be tranſmuted nor deſtroyed, and whereever removed, will make their appearance again when at liberty, in the ſame liquid ſtate as they were in before.

The particles of Water are exceedingly ſmall, for they may be ſo divided from each other, as that one ſquare inch of common Water ſhall when rarefied, fill a ſpace which will contain 14000 ſquare inches [f]; and it is computed that at leaſt 13000 particles of Water may be held on the point of a needle [g]; by which it appears, that what we call Water is an aſſemblage of a great number of ſmall tranſparent globules, which are compoſed again of an infinite number of ſmaller particles or atoms of this elementary liquor. The uſes and application of theſe general obſervations will ſoon occur.

Pure Water, without any mixture of earth, mineral, ſalt, or oil, we know not any in it's natural ſtate, but it is in ſome parts purer than in others, and beſt, where it is found ſufficient in quantity, and in greateſt degree of purity.

With Water in general few counties are ſupplied ſo well as Cornwall, and yet fewer are the places where Water is more precious; the moſt impure and infected Waters being of great uſe for mills, engines, and cleanſing the ores, and oftentimes rented at an exorbitant price. I have known twenty pounds a month given annually for one Water-courſe to drive an Engine-wheel, three years following; nay I am aſſured that fifty pounds a month have been given for the ſame purpoſe. Theſe Water-courſes are uſually not above the ſize of an ordinary Mill-ſtream.

SECT. III. Vapours and their riſe.

The parts of Water being ſo ſmall and moveable, are eaſily ſeparated one from another; and when they are ſo divided into ſmall parcels as to become about 800 times lighter than common Water, they are at leaſt as light as the air, and will, by every ſuc-

[f] Muſſchenb. pag. 738.

[g] Nieuwentyt's Exper. Muſſchenbr. p. 425.

ceſſive

ceſſive degree of ſeparation, riſe in the air in proportion to their lightneſs, the heavier air forcing the rarefied fluid to aſcend into the Atmoſphere till it finds a place where it reſts in equilibrium among bodies of equal lightneſs to itſelf. This ſeparation or comminution (if I may ſo call it) of Water into ſmall parcels, may be performed either by colliſion againſt harder and more compact bodies, or by heat. The firſt we often ſee performed at the bottom of Caſcades, where the Water that falls but a few fathoms, ſhall riſe in a miſt from the bottom where it is broke; and there are inſtances of clouds riſing from the fall of Waters which may be ſeen five miles off [h]. Colliſion will therefore excite vapours; but that which is more conſtantly producing this effect in every part of the univerſe, is Heat; whether from the Sun, which is always buſy this way, or from artificial ignition, or that generally inviſible elemental fire which is diſtributed through all matter. It has been by many Naturaliſts imagined, that heat raiſes vapours by extending the air incloſed in the pores of Water, and forming gradually a thin film or bubble of Water of ſuch dimenſions that it becomes greatly lighter than the ſame ſpace of common air, and therefore riſes above it: but this ſuppoſition is not tenable; for it is obſerved, that ſteam will riſe in the receiver of an air-pump, where, though there remains ſome air, there is not enough to conſtitute ſuch a proceſs. It may here alſo be added, that earth and ſtones and metals may be raiſed into the Atmoſphere, although their parts will not form bubbles as thoſe of Water will. As this too generally allowed ſuppoſition is not to be ſupported when ſtrictly examined, ſo neither is it at all neceſſary for us to conſider in this caſe any other than the diviſibility of Water, and the inſinuating and diſperſive qualities of fire; both evident in their effects. Fire, we ſee, ſeparates more or leſs the parts of all bodies, whether fluid or ſolid, and makes them riſe in the air: ſeparation therefore is all that needs be ſuppoſed; and fire does no more to Water, than to all other bodies under its power: it ſeparates it into ſuch ſmall portions, that the air is more ponderous than the ſteam, and of conſequence remains nearer to the earth by its ſuperiour gravitation.

The parts of vapour are not all equally ſmall, but ſmall according to the degree of heat which rarifies them: they will riſe in air, when rarified only 800 times; but they will riſe quicker, (that is, with greater force) and higher, according to all the intermediate degrees of rarefaction, from 800 to 1400. Vapour greatly heated becomes ſo elaſtick that it will move vaſt weights; nay, it appears from experiment, that, when it is ſufficiently rarified, it exceeds

[h] The fall of Waters at Niagara in North America, and that of the river Velino in Italy, Muſſchenbr. page 740.

the

the force of gunpowder [i] by the proportion at leaſt of two to one. Rarefied vapour is of great uſe in Cornwall, and enables the miners to get rid of the Water of their deepeſt works by means of the fire-engine (as will be more particularly ſet forth in the ſequel); an engine which acts more forcibly and conſtantly than any other Hydraulic machine hitherto invented.

SECT. IV. Damps.

Water having been now conſidered in its moſt minute ſtate (that of rarefied vapour) it muſt next be obſerved, that damps riſing in our mines oftentimes ſo affect the miner that he cannot work, neither will candles burn. This generally happens when the workings are got to any great diſtance from the communication with the open air; and the reaſon is this: Vapours are thrown up by the heat of that fire which all bodies more or leſs contain in themſelves or receive from other bodies; but in a deep mine they cannot riſe much above the ſurface of the ground, becauſe there is not air enough in the paſſes of the mine to buoy them up, conſequently they are too moiſt for reſpiration, becauſe they want a ſufficient mixture of air; neither can they yield that inflammable nouriſhment to the candle which common air by its own elaſticity, and its mixtures of oil, earth, and ſulphur, at all times does afford; ſo that the flame is ſtifled, being equally unable to throw off the parts which are burnt, and to promote a freſh ſucceſſion of oily parts requiſite to feed the fire. Theſe ſluggiſh damps are greater or leſs obſtructions to the workmen, according to the moiſture or drought of the ground: they have nothing pernicious, generally ſpeaking, in their own nature; they reſt near the bottom, and incommode merely for want of an active air to diſpell and raiſe them higher. Sometimes indeed theſe damps are infected with mundic, and are then very unwholſome, creating nauſeatings in the ſtomach, and in a few weeks making the viſage ſickly and wan; but I never yet heard of any damps in our Corniſh mines ſo venomous as to be immediately fatal; the reaſon of which may be this, that moſt of our mines yield a current of Water in the bottom; this ſtirs and carries off the damps, and prevents their ſtagnating into a thickneſs which clogs and ſtops all vital motion. In order to admit the air, a pipe or funnel of framed timber, about nine inches ſquare, is uſually fixed, and reaches from the top to the bottom of the mine; and when the damps are thick and ſtubborn, the air is aſſiſted in its deſcent by a bellows applied to the pipe. But this is a very ſlow and inſufficient remedy where any dangerous damps are apprehended. Much more effectual it is, according to a modern author [k], to throw from you as far as poſſible

[i] Muſſchenbr. p. 429. Sect. 873.

[k] Letter to Mr. Hooſon, author of the Miner's Dictionary.

into

into the ſuſpected or tainted pit, two quarts of ſpiritus urinoſus volatilis, which will occaſion ſo great a rarefaction as to overpower the poiſonous vapours, and for a long time ſupply the want of air; the miner taking care not to venture into the pit till twelve hours after the infuſion. Dr. Plot's propoſal [l] is more eaſily executed. He adviſes, that one peck of unſlacked lime may be thrown into ſuch ſuſpected place, which ſlaking in the Water, and fuming out at the top, will ſo effectually diſpel all poiſonous vapours in a little time, that there will be no further danger. Theſe may ſerve for temporary expedients, but the moſt effectual, though expenſive remedy is by a freſh ſhaft [m], to open a communication betwixt the drift and the common air.

SECT. V. Dews.

The Dews in Cornwall are not remarkably noxious to either herbs or animals, which I attribute to our having no long calms, nor laſting fogs.

SECT. VI. Springs and their Origine.

Springs may be divided into ſimple and mineral. Simple Spring-Water may be conſidered either as ſuperficial or ſubterraneous. By the ſuperficial, I mean thoſe Springs which riſe out of, or iſſue from, the ſurface of the earth; by the ſubterraneous, thoſe which have their chanels deeper, and their courſes longer under-ground. That ſuperficial Springs are the effects of rain and dews, cannot well be diſputed, when we ſee their encreaſe and decreaſe, according as the ſeaſon proves wet or otherwiſe; but whence the ſubterraneous, and thoſe which feel no alteration from the ſeaſons derive their origin, has employed the enquiries of the curious, and hitherto divided their ſentiments. Some think them owing to ſubterraneous heat; and no one labours more ſtrenuouſly for this opinion, than the learned Morton, in his Natural Hiſtory of Northamptonſhire, who has not only adopted what others have produced for the better confirmation of this hypotheſis, but has produced ſeveral thermometrical experiments of his own, in order to eſtabliſh it. He derives Springs (conſtant Springs more eſpecially) from vapours thrown up by ſubterraneous heat [n], and thinks his obſervations manifeſtly ſhew how the Water of ſuch Springs is ſupplied. His arguments are drawn from the heat people feel at their firſt entering the pit or well, which heat encreaſes manifeſtly as they deſcend [o]. "That wells in ſand are hotter than any other of like depth; and that the next degree of heat in wells, is in thoſe cut into a rock: That the faintings which ſeize the workmen, are

[l] Oxf. page 63.
[m] The pit by which we deſcend into mines we call a ſhaft.
[n] Northamptonſhire, page 296.
[o] Ib. 297.

owing merely to the greatneſs of the heat, and the thickneſs of the vapour in thoſe wells, and not to a ſulphureous or mineral halitus: That it is this thick vapour which extinguiſhes lights; and that the tepid ſtream is viſible in froſty weather [p]: That it is from this under-ground heat that the Water of our Rock-Springs is never frozen: That we meet with the like warm watery vapour in Caves as well as in Wells [q]. To ſupport this Hypotheſis, he next produces [r] his diary of the Thermometer ſuſpended on different days for different ſpaces of time at different depths, and notes how much the Spirit in the Thermometer did riſe by the warmth of his Well, above what it was in the open air before he let it down. But, with great ſubmiſſion, nothing certain can be concluded from theſe experiments in favour of the Hypotheſis here eſpouſed.

That it is warmer under-ground than it is above, eſpecially in the colder months of the year, in which all Morton's experiments were made [s]; and that at a great depth there is a greater difference, other circumſtances being equal, betwixt the air underneath and that above, than immediately or but a few feet under the ſurface, muſt be agreed; but the queſtion will remain to be decided, What this difference is owing to? The Atmoſphere is a congeries of many bodies, air, ſulphur, nitre, ſalt, earth, and fire, and capable of being chilled or heated by the different diſperſion or combination of its own uſual contents, as well as by the different influences of the celeſtial bodies. The air therefore is ſubject to great alterations of heat and cold; but where the air of the Atmoſphere cannot reach, a more even temperature prevails, and the cold of the common air ſhall not affect the air of places with which it has not a free communication any more than the heat: this is evident in paſſing from the open air into a cloſe room; and in a mine or well, where the air is leſs agitated by the wind, and not ſo mixed with the exhalations which occaſioned cold and froſt as the air above, it is impoſſible but it muſt be warmer for the generality, than it is upon the ſurface of the earth; and this is all that Morton's experiments prove. The ingenious and accurate Dr. Hales having placed ſix Thermometers, one above ground, and the reſt "with their balls immerſed in the earth, from two to 24 inches, at different depths, when the froſt of the winter 1724 was ſo intenſe as to freeze the ſurface of the ſtagnant Water near an inch thick, found that the Spirit in the Thermometer, which was expoſed to the open air, was fallen four degrees below the freezing point; the Spirit of that whoſe ball was two inches under-ground, was four degrees above the freezing point; the third, fourth, and fifth Thermometers, were pro-

[p] Northamptonſhire, pag. 298.
[q] Ibid. pag. 298.
[r] Ib. page 300.
[s] From December 9, to March 10.

portionably

portionably rais'd, as they were deeper, to the ſixth Thermometer, which, being two feet under-ground, the Spirit was ten degrees above the freezing point." Veget. Stat. p. 348. Now what are we to aſcribe theſe different degrees of warmth unto? To ſubterraneous fires, operating ſo uniformly within two feet of the ſurface? No, certainly; but to the coldneſs of the air above, and to the more equal temperature of the earth beneath, into which the cold of the air pierces leſs and leſs, in proportion to its diſtance from the ſurface, till at laſt the variations of the air have no effect at all. The truth is, fire is diſtributed in every part of our globe; and in the bowels of the earth, it is not ſubject to the checks and reſiſtance of cold, ſo much as it is near the ſurface; hence ariſes a ſenſible difference; and it is warmer where this fire has liberty to act, than where it is controuled and repelled by freſh and cold air. But this ſuperiour heat below cannot be a cauſe of ſufficient power to produce the effect now in queſtion; I mean, the Origin of Springs: this univerſal fire, whilſt it remains diſperſed in that harmleſs equilibrium to which Providence has graciouſly deſtined it, is weak and feeble, and its power to evaporate Water, even under-ground, muſt be too ſmall and inconſiderable to give riſe to all conſtant Springs. If there were ſuch a ſubterraneous central fire as ſome learned men[t] have fancy'd, conſtantly exerting itſelf, and acting with a force gradually greater as it is nearer to the centre of the earth, this would be a cauſe ſufficient, and equal to the effect; but that there is any ſuch fire does by no means appear; neither is it conceivable that any ſuch fire can ſubſiſt without preying upon, and perpetually conſuming, the vitals of the earth. If there was any ſuch fire, the deeper we deſcend in mines the hotter we ſhould feel it, the heat increaſing by equal degrees the nearer we approach the ſuppoſed region of fire; but no ſuch regular increaſe was found by the ſedulous experiments of Morton. In the ſecond experiment[u], Feb. 16, at 9, a. m. the Thermometer ſtanding low, viz. at five degrees below hard froſt in the open air, when ſuſpended for the ſpace of one hour in a Well, at the depth of 25 feet, it roſe 14 degrees. Feb. 27, 9 a. m. ſtanding at two degrees below hard froſt in the air, when ſuſpended at the depth of forty feet, it roſe ten degrees in leſs than half an hour; and Feb. 24, 1703, (See the ninth Experiment) ſtanding at half a degree below hard froſt, it roſe ſixteen degrees in a quarter of an hour, when ſuſpended at forty feet; and when at hard froſt, December 13, 1704, it roſe ſixteen degrees in a quarter of an hour, when ſuſpended at twenty-three feet two inches (Experiment XII.): hence it appears, that when the ſpirit

[t] Woodward Nat. Hiſt. page 120.

[u] Ib. p. 300.

was

was low, and the common air was very cold, the ſpirit roſe much at ſeveral depths in the well; but when the Spirit of the Thermometer ſtood higher in the common air, the alteration was leſs: for Feb. 25, 1702, (Experiment III.) when the Thermometer ſtood two degrees below juſt freezing, it roſe but five degrees, when ſuſpended at twenty-one feet, for half an hour; and March 10, 1702, (Experiment 8.) the Thermometer ſtanding at two degrees below juſt freezing, it roſe but ſeven degrees though ſuſpended at ſixty feet for an hour; by which it is only plain, that the colder the Atmoſphere, the greater is the difference between that and the more even temperature of the air below in the well, and the Thermometer riſes higher, but not in any given proportion to the depth; ſo that what is here advanc'd cannot confirm the hypotheſis now in queſtion. That vapour, or moiſt ſteam, riſes from all waters, and is indeed diſperſed more or leſs in all places, not only in places open to the Atmoſphere, but in the cloſeſt rooms and the deepeſt cells of the earth, is certainly true: Water will eaſily fly off in evaporation, ſometimes imperceptibly, oftentimes, and in cold weather more eſpecially, viſible, as being condenſed into larger globules by the ambient cold; and where there are ſubterraneous heats occaſioned by the fermentation of Pyrites, Sulphur, Salt, and ſuch mineral promoters of warmth, there this evaporation is copious and extraordinary, but ſtill not equal to the effect, to the plenteous ſtreams, and even immediate rivers which proceed at once from the bowels of the earth in ſome places; neither is there reaſon to ſuppoſe ſuch ſubterraneous heats every where and at all times, nothing being more uncertain and unequal, than the diſtribution of ſuch igniting mineral mixtures. 'Tis reaſonable then to conclude, that the ſubterraneous heats which either reſult from the fermentations of mineral mixtures, or from the equal diſtribution of fire through all matter, are not ſufficient where they are, nor conſtantly enough found in any place, to ſupply perennial ſprings. The groundleſs fancy of a central fire, and that mountains are alembicks in which the vapours are collected and diſtilled down their ſides, is too chimerical to need confutation.-----Again, That perennial ſprings do owe their riſe to rains and dews is diſputed, and thought unlikely, becauſe they do not ſeem to be at all affected by the exceſs or deficiency of either, let us conſider therefore the nature of fluids and the texture of the earth together, and ſee whether perennial ſprings may not principally be owing to the waters of the Atmoſphere although neither increas'd by heavy rains, nor ſenſibly diminiſhed by great droughts.

The earth muſt not be looked upon as an abſolute dry maſs exhibiting here and there its wonders in pouring forth a ſpring

or

or fountain where there was no water before; the earth is porous in all its parts, full of chinks and ducts in moſt places, and opens into wide ſubterraneous caverns in others: Water is perpetually falling and inſinuating itſelf by its own gravitation and fluidity into the hollows it meets with, or raiſed from lower into higher poſitions attracted by ſalts or ſands, or tranſpired in vapour, ſo that ſink as deep as we will, we find water either at reſt in natural cavities, or circulating from higher into lower chanels, ſometimes in large currents, oftner in ſmall threads and rills, but in ſome ſhape or other every where coaſting through the veins of rock or clay, till it meets with ſuch reſiſtance from the ſtrata that it is forc'd out through the ſoil into the open air. This is the general ſtate of the earth, and to continue this moiſture (without which the earth muſt ſoon become a dry ſapleſs cruſt) freſh ſupplies are perpetually deſcending from rains and dews, and ſoaking into the earth from lakes, moraſſes, rivers, and brooks; where the paſſages are free and open, the deſcent is quick, and the increaſe of ſprings eaſily to be perceived, but where the chink and clefts of the rocky ſtrata are cloſe, or a large horizontal, impenetrable rock interpoſes, or where the fallen moiſture is forced by any other obſtacle to take a large round before it can ſupply any conſtant ſpring, there preſent ſudden rain can have no viſible effect. If the ducts which collect and convey theſe waters to their apertures are long, ſerpentine, and many, the ſpring ſhews no want of moiſture in times of drought, becauſe of the many ducts which ſerve it, nor any increaſe after heavy rains, becauſe the chanels of its nouriſhment are long, winding, and require time to reach the fountain head. Again, if perennial ſprings derive their water (as may often be the caſe) from large caverns which alſo have their ſupplies from rain, by ducts of a determined number and certain dimenſions, which are neither contracted nor dilated, then will the ſtream be one certain equable quantity, let the ſeaſon be ever ſo wet and rainy. If the ſeaſon be extremely dry theſe caverns are capable of ſupplying the perennial ſprings to which they give riſe, till freſh ſupplies from rain, or dew, or bog arrive, which muſt generally be the caſe before the caverns are exhauſted. From this ſhort view of the internal ſtructure of the earth, it appears that there is nothing ſurpriſing in ſprings being perennial, they are nothing more than a collection of little rills of water, (as rivers are a collection of brooks) which tending nearly one way are united at laſt, and break out into open air, and though they owe not their immediate riſe to the waters of the Atmoſphere, as the temporary occaſional ſprings do, yet proceed from ducts and reſervoirs fed by the moiſture of the adjacent ſtrata, which moiſture primarily proceeds from ſnow, hail, dews, and rain, though more

ſlowly communicated, and diſtributed by greater quantities into ſome ſtrata than into others.

SECT. VII. Rain and Clouds neceſſary.

Here I cannot but obſerve a great miſtake in ſome ingenious writers of Natural Hiſtory, who very undeſervedly look upon rain, as a puniſhment inflicted upon mankind for the ſins of the antediluvian world, imagining that there was no ſuch thing before the flood, even nothing but ſerene ſkies, and plentiful dews. But it may be aſked, Was there any ſun, any ocean, rivers, herb, plant, or tree? If there were, there muſt have been rain, nay violent rain. Could dews ſupply that moiſture which the ſun exhaled? What would become of Egypt where there is little or no rain, if it were not for ſomething more than dew; if it were not for the river Nile? and whence comes the increaſe of their Nile, to which they owe the plenty of their grounds, but from the periodical Rains of Ethiopia? and what is the miſery of that otherwiſe fertile and delightful country, but their want of Rain? Is not all vegetation at a ſtand, even in an Engliſh climate, after a long drought, notwithſtanding the ſummer dews are then moſt frequent? How much greater ſtill is the heat and drought betwixt the tropics? and how much more neceſſary the Rain in ſuch hot countries? Dews are vapours exhaled by the Sun in its decline, and therefore riſe but a little way into the Atmoſphere, before the cold of the night arreſts, condenſes, and precipitates them: and what are theſe dews to all the vapours which the Sun in its ſtrength muſt raiſe? What became of the day-vapours exhaled by the Sun; what hindred them from coaleſcing into drops, and thoſe drops from falling, when they were become too heavy for the medium they ſwam in? and what hindred the Antediluvian ſeas and rivers from becoming dry but the returns of Rain? In ſhort, if the Antediluvian world was without Rain, it was without the chief balance for the heat of the Sun, and that kindly moiſture which the winds were chiefly deſigned to waft from place to place, and diſtribute by drops in ſuch gentle parcels as might relieve and refreſh both plants and animals; nay, not only gentle but violent Rains are as neceſſary to the orderly courſe of natural things as violent winds; they both tend to prevent ſtagnations in the Atmoſphere and the Ocean, to diſperſe poiſonous exhalations, and to diſtribute moiſture and air where there was none before, or at leaſt where there was much want.

Another error which theſe refined Naturaliſts were obliged to hold in conſequence of the former, is, that the Antediluvian ſkies were without clouds, by which equally groundleſs fancy they ſtripped the poor Atmoſphere and reduced it to a naked blank, forgetting nature in her gayeſt dreſs, nor conſidering that the richeſt ſtreams of light,

and

and the fineſt tints which the eye can ſee, or the pencil imitate, are borrowed from clouds.

SECT. VIII. Of Wells of pure Water.

By pure Water, I mean that which is moſt ſimple, taſteleſs, clear, and inodorous. Of this kind we have great quantities in all parts of Cornwall, but ſome Springs are more noted than others.

Maddern Well.

The ſoil round Madern Well, in the pariſh of Madern, is black, boggy, and light, but the ſtratum through which the Spring riſes, is a grey moorſtone gravel, called, by the Corniſh, Grouan. Here people who labour under pains, aches, and ſtiffneſs of limbs, come and waſh, and many cures are ſaid to have been performed [w], although the Water can only act by its cold and limpid nature, foraſmuch as it has no perceivable mineral impregnation. Hither alſo upon much leſs juſtifiable errands come the uneaſy, impatient, and ſuperſtitious, and by dropping pins or pebbles into the Water, and by ſhaking the ground round the Spring, ſo as to raiſe bubbles from the bottom, at a certain time of the year, Moon, and day, endeavour to ſettle ſuch doubts and enquiries as will not let the idle and anxious reſt. Here therefore they come, and, inſtead of allaying, deſervedly feed their uneaſineſs; the ſuppoſed reſponſes ſerving equally to increaſe the gloom of the melancholy, the ſuſpicions of the jealous, and the paſſion of the enamoured. As great a piece of folly as this is, 'tis a very antient one. The Caſtalian Fountain, and many others among the Grecians, was ſuppoſed to be of a prophetic nature [x]. By dipping a fair mirror into a Well, the Patræans of Greece received, as they ſuppoſed, ſome notice of enſuing ſickneſs or health, from the various figures pourtrayed upon the ſurface. In Laconia they caſt into a pool, ſacred to Juno, cakes of bread-corn; if they ſunk, good was portended; if they ſwam, ſomething dreadful was to enſue [y]. Sometimes they threw three ſtones into the Water, and formed their concluſions from the ſeveral turns they made in ſinking [z].

Euny Well.

In the pariſh of Sancred there is a Well whoſe Water riſes in the ſame kind of ſoil as Madern Well; and as a witneſs of its having done remarkable cures, it has a chapel adjoining to it, dedicated to St. Euinus [a]; the ruins of which, conſiſting of much carved ſtone, beſpeak it to have been formerly of no little note. The Water has the reputation of drying humours, as well as healing wounds and ſores. It gives no perceivable evidence of any mineral impregnation; neither need it to produce the effects attributed to it, for certain it is, that the mere coldneſs of Water will work ſurprizing cures; wounds, ſores, aches, diſordered eyes, and the like, are often cured

[w] See Camden's Britannia, page 13.
[x] Clem. Protrept. Pott. Gr. Antigu. page 288.
[y] Ib. 296.
[z] Ib. 350.
[a] Commonly called Chapel-Euny.

by

by that quality only; the cold by bracing up the nerves and muſcles, and ſtrengthening the glands, promotes ſecretion and circulation, the two great miniſters of health. In the northern kingdoms they are ſo ſenſible that all extraordinary defluxions of humours are owing to too great a relaxation of the parts, that they keep carefully the water of ſnow gathered in March, and apply it as a general remedy for moſt diſeaſes: but the common people (of this as well as other countries) will not be contented to attribute the benefit they receive to ordinary means; there muſt be ſomething marvellous in all their cures. I happened luckily to be at this Well upon the laſt day of the year on which (according to the vulgar opinion) it exerts its principal and moſt ſalutary powers: two women were here who came from a neighbouring pariſh, and were buſily employed in bathing a child: they both aſſured me, that people who had a mind to receive any benefit from St. Euny's Well, muſt come and waſh upon the three firſt Wedneſdays in May. But to leave folly to its own deluſion, it is certainly very gracious in Providence to diſtribute a remedy for ſo many diſorders in a quality ſo univerſally found as cold is in every unmixed Well-water.

Holy Well. Another Well of this plain kind, and of no little reſort, is that called Holywell, about a mile and half to the North Weſt of St. Cuthbert's Church, in a ſmall ſandy bay where there are ſeveral caves wrought into the cliff by the northern ſea. In one of theſe caves, at the north-eaſtern point of the bay, at the foot of a high cliff is this Well. The entrance is low, but by the help of ſome ſteps cut into the rock, you aſcend about fifteen feet perpendicular, where the water which diſtils from every part of the roof, is collected into a little baſon, from whence proceeds a ſmall rill about the bigneſs of a reed. As the Water percolates through the interſtices of clay and ſtone, it brings down with it ſome of the finer parts of both, which form into ſeams and ridges correſpondent to the fiſſures through which they proceed; ſome ſhort mammillary ſtalactites hang from the roof; the floor of the rock, on which you tread, is covered with the ſame ſubſtance, and as the rock is ſhelving, the incruſtations are ſo many wavy proceſſes covering the unevenneſs of the rock. I mention theſe particulars the rather becauſe ſuch productions of the alabaſter kind are extreamly ſcarce in Cornwall, and I have yet ſeen none worth notice but here. The water is much commended in fluxes, and diſorder'd bowels. Upon trying this water, I found that with green tea it altered not it's colour; with milk it curdled not; ſo that it has neither ſteel nor alum in it's compoſition. I evaporated it to one half, no pellicle appeared, nor any cryſtallized ſhoots on it's cooling; ſo that it has no acid ſalts; but it depoſited a ſmall ſediment of the

ſame

ſame colour and ſubſtance with the calcarious incruſtations of the well. I therefore in the next place pulveriz'd ſome of the incruſtations brought from the well: Upon burning them over the fire they did not melt; had no particular taſte or ſmell: Upon throwing ſome of the powder into the fire, concluding that if there were any ſulphur in it the flame would have turn'd blue, it had no viſible effect: I put a red-hot iron to it, but it ſent forth neither ſmoke nor ſcent. Upon the whole, this water appeared ſimple and unimpregnated; nothing but the earth which forms the calcarious coverings of the roof and floor of the cave appearing in it. But when I ſay there is no ſteel, no alum, no acid ſalts or ſulphur, I would not be thought peremptorily to aſſert, that there is nothing of that kind; I mean only, that there is not any one of theſe viſibly predominant; for Nature mixes and qualifies her ingredients inimitably and inſcrutably. We may poſſitively affirm, that ſuch and ſuch ingredients are to be found unqueſtionably in Waters; but others may be alſo there in a quantity to us indiſcoverable; and therefore we cannot abſolutely affirm, that in any Water there is no ſuch ſalt, ſteel, ſulphur, or the like.

SECT. IX. Of Mineral Waters.

In Cornwall there is a great number of thoſe Waters, which, from their principal ingredient, are called Chalybeate. The ſtrongeſt Water of this kind, and moſt remarkable for its cures, which I have heard of, or had the opportunity of examining, is that which riſes in the tenement of Colurian in the Pariſh of Ludgvan. The bed through which this Water flows, is a looſe pebbly ground, mixed with a gravelly clay, full of the ochrous iron mineral, from which the taſte and ſmell of the Water proceeds. Upon trying it ſeveral times with galls, it turned a deep reddiſh purple; with green tea, a lighter purple; with oak leaves, a blue-black of a purple caſt. Upon pouring two thimbles full of ſpirit of vitriol into half a pint, it made but a ſmall efferveſcence. I let the Water with the galls only ſtand for ſome time, and it retained its purple and tranſparency; whereas, if it had turned black and turbid, as ſome Waters do [b], that would have been a diſadvantageous ſymptom. Upon dropping gently a large thimble full of ſyrup of violets, about three fourths of an inch of the Mineral Water, towards the top of the glaſs, kept its uſual colour; the middle part turned to a pale greeniſh yellow, which reached to within half an inch of the bottom; and the remainder was of a light purple: but upon ſtirring it, after it had ſtood half an hour, the whole became a deep green. Upon dropping a thimble full of oil of tartar, it fell immediately to the bottom of the

[b] Shaw on Mineral and Iſlington Waters, page 227.

glaſs, which held about half a pint, but precipitated no ſediment, nor turned the Water milky, thick, or chalky; if there was any alteration, the colour ſeemed more inclinable to a bright ochre, but ſcarce diſcernable; an experiment much in favour of this Water [c]. Upon ſuſpending a piece of poliſhed ſilver for about an hour in the incloſed Well, the ſilver turned not blackiſh; by which it appears, that little or no ſulphur exhales from this Water. In the morning, before the Water is ſtirred, there is a film or ſkin on the ſurface of a rainbow colour, ſhooting to and fro; by which may it be preſumed, that there is a ſulphur or naphtha mixed with this Water, which riſes and ſettles on the top when the Water is left quiet for any time [d]? In a calm but not very warm morning, on the 7th of Auguſt, 1734, O. S. before ſix o'clock, I found the Water, both in the incloſed Well and without, where it ran expoſed to the air, almoſt blood-warm, and the common Water, which runs about nine feet from the Chalybeate, as cold as ſnow. I ſtayed ſome time, and found the difference ſtill continue, by which it is to be concluded, that the Chalybeate Spring derives a ſenſible heat from the bed of iron, vitriol, and pyrites, which it paſſes thro' [e]. Having carried the Water a mile or two, it loſt that warmth; whence we may infer, that ſuch acidulæ as this cannot be ſo kindly to the ſtomach and inteſtines at a diſtance, as when drank on the ſpot. Being expoſed to the open air for twenty-four hours, it ſuffers no alteration from galls; and the ſteel being deſerted by the volatile ſpirit, and the common menſtruum imbibing the moiſture of the adjacent air, becomes weaker, and a ſtringy yellow ſediment may be obſerved making its way to the bottom of the glaſs. It is a ſmooth Water, mixes well with milk, and lathers eaſily with ſoap.

There are many living evidences, within the compaſs of my knowlege, of the great virtues of this Water. Two perſons (of which I have ſufficient proof), by drinking and waſhing the part affected, have been cured of the King's-evil; and many others are ſaid to have been ſo. It is very dieuretick, paſſes forcibly by perſpiration, promotes evacuation, removes obſtructions and ſwellings of the abdomen, and reſtores loſt appetite. Externally applied it cures ſores and ſcrophulous eruptions, and is a very good collyrium for the eyes.

Theſe virtues of Chalybeate Waters (uſual in ſome degree, but ſeldom ſo eminently as here) make them a remedy of great extent for the diſorders of the human body, and this is doubtleſs the reaſon

[c] Shaw on Mineral and Iſlington Waters, page 159.

[d] See Plot's Staffordſhire, page 137, and Oxfordſhire, page 44, Sect. lvi.

[e] Mallow Chalyb. Water, in the county of Cork, Ireland, raiſed Farenheit's Thermometer to ſixty-nine degrees, when the adjoining brook ſunk it to fifty. Briſtol Hot Well, though not Chalybeate, raiſes the Thermometer to ſeventy-ſix. Hiſt. of Cork, vol. II. p. 277.

that

that they are moſt kindly diſtributed into every corner almoſt of the world. But it muſt not be imagined that they can do no hurt: like all other medicines, they have their ill tendencies, when improperly applied, or uſed to exceſs; and therefore the time of uſing them, the neceſſary correctives in particular caſes, as well as the quantity and time of omitting them, are ſurely beſt learned from a phyſician.

There are many other Wells of this kind in Cornwall [f]; Iron, being more eaſily diſſolved and imbibed by running Water than any other mineral, which is the reaſon that there are more Chalybeate, than Salt, Sulphurous, or Aluminous Springs; but the deſcription of more than one, as the effects of all are ſo very like, would be needleſs, unleſs there was ſome remarkable cure, and peculiar property aſcribed, neither of which has in any of them as yet reached my notice.

Many Naturaliſts have endeavoured to give us the analyſis of thoſe Waters: In all, the ingredients diſcovered are much the ſame (ſalts only excepted); and it is the different quantity of particular ingredients, and the proportion they bear to the Water, which is their vehicle, that makes them ſtronger or weaker. Our Spas in England are not ſo ſpirituous and pungent as the celebrated ones of Germany; yet, in many caſes, they may be of great and extenſive uſe; and, if I am well informed, the Spas of our own country may in moſt caſes ſupply the place of the other, though more famous foreign waters.

As to ſaline, aluminous, hot, bitter, or ſulphurous Waters, which deſerve ſtrictly to be ſo called, I have not been able to learn that there are any ſuch in this County.

I have ſeen a letter from the late Mr. Vallack (an apothecary of character in the town of Plymouth, and among thoſe of his buſineſs noted for his ſkill in chemiſtry), in which he affirms, that Carn-Kei Water, near Redruth, is impregnated with tin. His words are theſe, in a letter, dated January 5, 1741-2: "I have not only read in Mr. Boyle's Hiſtory of Mineral Waters, but have ſeen the Water at Keyrn-Key, near Redruth, which I found impregnated both with iron and tin. It is the only Water I ever read of, or met with ſo mixed." This is very rare, but not improbable. I have had no opportunity of trying this Water myſelf, and therefore can neither confirm nor diſprove what is ſaid; but as tin is frequently found intimately connected with iron ore, I apprehend that the

[f] Scarlet Well, near Bodman, was once much frequented, and is ſaid to be much heavier than other Water, and will keep without alteration of ſcent or taſte moſt part of a year; repreſenting many colours like that of a Rainbow. (Carew, page 127.) At preſent it is ſcarce known where this Well is to be found.

depoſit

depoſit of this Water might give ſufficient reaſon for the aſſertion.

Petrifying Waters; ſuch, I mean, as will incruſt bodies put into them with ſtone, I have not yet heard of any in Cornwall, except the Water at Holy Well, in Cuthbert, before-mentioned (pag. 32.) may be called ſo. Our River, Lake, or Sea Water, have not any taſte, colour, or property, more than common, but muſt however be here treated of as to their riſe, courſes, extent, and iſſue, harbours, and tides; their preſent uſefulneſs, and their capacity of being render'd ſtill more uſeful.

CHAP. IV.

Of the Rivers and navigable Creeks in Cornwall.

IN the middle of this County, betwixt the North and South Sea, the land is mountainous, (as has been obſerved before, chap. i.) and the mountains make a kind of broken chain the whole length of Cornwall; the links of this chain are much more large and maſſive, if I may ſo ſay, in the Eaſt where the land is wideſt, but they contract and narrow themſelves as they tend to the Weſtward, conforming their ſize, as well as ſhaping their courſe according to the land. On each ſide this high ridge the land ſpreads into a plainer ſurface, rather more hilly on the North than on the South, but on both ſides declining to the ſea. This general diſpoſition of the land is far from being diſadvantageous; for the ridge of hills running nearly Eaſt and Weſt, by intercepting the rain, fogs, and dews, diſtributes them again in plentiful and frequent ſtreams, on either ſide watering the Sea Coaſt, the Northern Coaſt well, but the Southern much better; an effect entirely owing to the rains being more frequent on the Southern ſide of our hills, than thoſe which come from the North. Upon the whole, it may ſafely be aſſerted, that few ſpots of land of equal extent in England are ſo well watered as Cornwall.

Tamar. Tâmar [g] is the Eaſternmoſt River in Cornwall; it riſes in Morwinſtow, the moſt Northern pariſh of this County, about three miles from the Sea Coaſt: in June 1757 ſo inconſiderable at its ſource, that it was with ſome difficulty we found where it riſes,

[g] "A great number of our larger Rivers begin with the word Tav and Tiv, or, as antiently written, Tam or Tim. Hence Thame or Thames, Tav, Taüy, &c. This Tam is in all probability the ſame with the Greek Tamos in Πόλαμος, πο in Greek being an old prepoſitive." Lhuyd in Baxter's Gloſſar. page 265. "Mâr, Mêr, and Môr, ſignified antiently Water as well as Sea," ibid. page 266. Tâmar therefore ſignifies the large River-water, and ſhould be written Tâmar, quaſi Tau-mar.

which

which was on the ſummit of a moor, from whence the ground, declining to the North, makes way for part of the water to run northerly, which is the head of the River Turridge, navigable a little above the town of Bideford, and the ground ſhelving away on the other ſide at the ſame time to the South, drains away the bogs of the ſame moor to the Southward from the ſame fountain, and forms the beginning of Tamar, which, at the diſtance of ten miles, becomes conſiderable enough to give name to the ſmall pariſh and village of North Tamarton [h], where leaving a bridge of ſtone, it continues on to the South till it enters the pariſh of St. Stephen's [i], at the corner of which pariſh it receives a very plentiful ſtream, called Werington River. About a mile and half farther down it receives the Aterey [k] River (which runs under the walls of Lanceſton), and becomes ſoon after, at Polſtun bridge [l], a conſiderable, wide, and rapid ſtream. Hence it coaſts on nearly South, receiving the brooks from each ſide, till it has paſſed Graiſtun [m] bridge [n], a mile below which, it receives the Lowley River, and ſoon after a more plentiful ſtream from Altarnun, Lewanic, and Lezant pariſhes, called the Inny, and the place where it joins the Tamar, called Inny-foot [o]. The Tamar increaſing ſtill, has a high, ſtrong, ſtone bridge, in Stokelymſland, called commonly Horſe Bridge, but by Leland [p] Hawtebrig; that is, High Bridge. The laſt bridge on this River is in the pariſh of Calſtok, begun, ſays Leland [q], by Sir Perſe Edgcumbe [r]. The tide almoſt reached this bridge in the time of Henry VIII [s]. but it was navigable no further than Morleham, about two miles below, to which ſmall barks ſtill come. Five miles farther down, the Tamar receives the Tavy on the Eaſt, and, having made a Creek into the pariſhes of Botsfleming and Landulph on the Weſt, becomes a ſpacious harbour, and waſhing the foot of the antient borough of Saltaſh within half a mile, is joined by the Lynher Creek and River, then paſſing ſtraight forward forms the noble harbour of Hamoze [t], called formerly Tamerworth [u]; where making two large Creeks, one called St. John's, the other Millbrook, at the Weſt, and Stonehouſe Creek at the Eaſt, (after a courſe of about forty miles, nearly South) the Tamar paſſes into the Sea, having Mount Edgcumbe for its weſtern, and the lands of Stonehouſe and St. Ni-

[h] The Tamara of Ptolemy, as is ſuppoſed, Camden's laſt edition, page 25.

[i] By Lanceſton.

[k] "A Broke renning in the botom in the Suburb, caullid Aterey." Leland, Itin. vol. III. page 115.

[l] A large and fair building of ſtone, built, as Leland ſays, ib. by the Abby of Tavyſtock.

[m] So in Leland, ib. for Greyſtone.

[n] A light, handſome work of ſtone, conſiſting of nine arches; the tread of it 318 feet long, twelve feet wide between the walls, and twenty-ſeven high from the water, in ſummer.

[o] The ſame River gives name alſo to a wood in the Manor of Lawhitton, called Inny-ham Wood.

[p] Vol. II. page 78.

[q] Ibid.

[r] It is ſometimes called Newbridge, ſometimes Caulſtoke Bridge. See Leland, vol. III. page 29.

[s] Leland, ib.

[t] Saxon name Ham-oze; that is, the wet oozy habitation, circuit, or incloſure.

[u] Camden, page 26.

cholas Iſland, in Plymouth Sound, for the eaſtern boundary. This River, by the appointment of King Athelſtan, the Saxon, (A. D. 938.) was to be the general boundary of the Corniſh Britans; but when the Normans came in, and the Kingdom became ſubdivided into Lordſhips and Manors, (thoſe little Kingdoms within a Kingdom) Barons, jealous of the extent, rights, and honours of their Manors, procured their lands on the borders, to be appropriated to the county in which their domains and chief places of reſidence were fixed [w]. Hence it happens that this Saxon law of Athelſtan in four inſtances has given way to the ſucceeding regulations of the Normans, and though the River is reckoned in Cornwall [x], yet Devonſhire intrudes for ſeven miles in length and three in breadth at Werington, and claims the two pariſhes there of Werington and North Pedherwyn, as it does alſo the manſion, domain, and park of Mount Edgcumbe, at the Tâmar's mouth. This laſt incroachment upon the general boundary was owing probably to the powerful intereſt of the Valtorts (a noble family of large revenues in Cornwall, but uſually reſident in Devon) antiently proprietors of the place now called Mount Edgcumbe; and, as I imagine, the former was owing to the like intereſt and application of the Abby of Tavyſtock in Devon, which had the property of Werington, and (as Leland ſays, vol. III. page 115.) "had fair landes thereabout." But though theſe places were, by the interpoſition of their Lords, ſubjected to the civil authority of Devon, yet care was taken to preſerve the rights of the Clergy inviolate: they are taxed as belonging to the Hundreds of Cornwall in the Lincoln taxation, made in the 16th of Edward I. A. D. 1288, and they ſtill continue ſubject to the juriſdiction of the Archdeacon of Cornwall. On the other hand, Cornwall alſo exceeds its antient limits near North Tamarton, having a ſmall ſlip of land of about two miles ſquare on the eaſtern bank, but why, I am not informed: again, over againſt Saltaſh, it claims a ſmall portion of land not a mile ſquare, owing, as I imagine, to the application of the Lords of Saltaſh, and the Caſtle of Trematon adjoining.

River Lynher.

The next conſiderable River is the Lynher, called ſo from the Lake it makes before it joins the Tâmar at Hamoze [y]. It riſes on the hills of Altarnun pariſh, about eight miles Weſt of Lanceſton, coaſts down to the South South Eaſt through the pariſhes of North-hill, Linkinhorn, and South-hill; and paſſing about a mile from the

[w] There are ſome inſtances of this kind in other counties, and indeed in foreign countries, particularly in Germany, where all the poſſeſſions of the Houſe of Auſtria are accounted in that circle, let them lie within what other circle ſoever. Plot, Oxfordſhire, chap vi. ſect. lxxxv.

[x] "The juriſdiction of the Water doth wholly appertain to the Dutchy of Cornwall, and may therefore be claimed as a part of that County." Carew, page 99. which is confirmed alſo by the profits of the paſſage at Saltaſche, the tax on all boats and barges that pertain to the harbour yearly, and the anchorage and ſoilage of all ſtraunger ſhips; all belonging to the borough of Saltaſche in Cornwall." Norden, page 98.

[y] See Leland Itin. vol. V. p. 79.

borough

borough of Calinton, divides the park at Newton-ferrers, formerly the Seat of the late Sir John Coryton, Bart. and by Pillaton and Lanrake comes to Natter (aliàs Noddetor) Bridge[z], where it is navigable, and, by the help of the Sea, begins Lynher Creek: hence continuing its courſe four miles farther, between the pariſhes of Cheviock and St. Stephens, it then turns to the Eaſt, and, agreeably to its name Lynher[a], making a fair haven betwixt Eaſt Anthony and St. Stephen's, joins the Tâmar, after a courſe of about twenty-four miles. In the ſummer this ſtream is ſmall, but in the winter rapid, overflowing, and dangerous, of which alternate extremes Mr. Carew (page 111.) in quaint, but not unharmonious ſtrain, thus expreſſes himſelf according to the manner of his time*.

I.

When ſun the earth leaſt ſhadow ſpares,
And higheſt ſtalls in heaven his ſeat,
Then Lyner's peebly bones he bares,
Who like a lamb doth lowly bleat,
And faintly ſliding, every rock
Plucks from his foamy fleece a lock.

II.

Before a River, now a Rill,
Before a fence, now ſcarce a bound,
Children him o'erleap at will,
Small beaſts his deepeſt bottom ſound,
The heavens with braſs enarch his head,
And earth of iron makes his bed.

III.

But when the milder-mooded ſkie
His face in mourning weeds doth wrap,
For abſence of his cleareſt die,
And drops tears in his center's lap,
Lyner 'gynnes lion-like to roare,
And ſcorns old bankes ſhould bound him more.

IV.

Then, ſecond Sea, he rolles, and bears
Rocks in his wombe, rickes on his backe,
Downe-borne bridges, up-torne wears,
Witneſſe and wayle his force, their wracke

[z] Leland, vol. III. page 28, calls it Natter; and ſo again, ib. page 29. Carew, page 54, calls it Noddetor Bridge.

[a] Lyn in the Cornubritiſh ſignifying a Lake, it being not unuſual to denominate Rivers from the extraordinary ſpread of water they make in ſome particular place: thus we have in this County three Rivers called Lo, from their making a lake at their mouth: hêr ſignif: long; Lynher, longus lacus.

* Reign of Elizabeth.

Into

Into men's houſes fierce he breakes,
And on each ſtop his rage he wreakes.

V.

Shepheard adiews his ſwymming flocke,
The hinde his whelmed harveſt hope,
The ſtrongeſt rampire fears his ſhocke,
Plaines ſcarce can ſerve to give him ſcope,
Nor hills a barre, whereſo he ſtray'th
Enſue loſs, terrour, ruine, death.

River Tide, or Tidi.

The Lynher Creek, about four miles below Natter bridge, joins St. German's Creek, made by the River Tidi, which has its riſe on the South ſide of Caradon Hill, near Liſkerd, where there is a place called Tidicomb, another Tidewell; and after dividing Quethiok pariſh from Minheneth, it enters the pariſh of St. German near Molinic, and about two miles lower becomes navigable at a place called Tidi-ford, (or the firſt ford on the Tidi) about two miles lower, it waſhes the ſides of the antient borough and formerly Epiſcopal See of St. German, whence the Creek below is called St. German's Creek; and joining the Lynher, they both together proceed into the Tâmar.

Seaton River.

Seaton is the next River: it riſes in St. Clare, about four miles to the North-Eaſt of Liſkerd; and paſſing within a mile of that borough to a place thence called Lanſeaton, goes through Minheneth pariſh, and dividing St. German's on the Eaſt from Morval, and St. Martin's on the Weſtern bank, falls into the Sea at Seaton, after a courſe of about twelve miles. The antient town, which probably gave name to this water, muſt have lain at its mouth, or opening into the Sea; but there are no remains to be ſeen: the town therefore has probably been ſwallowed up by the encroachments of the Sea, which in this place have been very conſiderable, if we may regard the tradition of the neighbourhood.

Loo, or Eaſt Loo River.

Loo, or Eaſt Loo [b], has its riſe alſo in the highlands of St. Clare; and paſſing under Liſkerd park, divides Keyne pariſh from Liſkerd, then Morval from Dulo; and becoming navigable at Sand-place, empties itſelf, about three miles after, between two little boroughs, which have their names, Eaſt Loo and Weſt Loo, from the River, as the River has its name from the large Pool, which it makes every full tide, between the two towns. Its whole courſe is about ten miles. Here is a ſtone bridge of fifteen arches [c], one hundred and forty-one yards long, and ſix feet three inches wide betwixt the walls.

[b] Alſo Loow and Loowe, Leland, vol. VII. page 113. and Low, ib. page 114. and vol. III. page 26. Wallice Lhüch, Cornu-brit. Lûh. Ir. Lough. Scot. Loch. Anglicè, Lake, Pond, or Pool.

[c] Including two ſquare openings made for the more commodiouſly paſſing boats laden with wood.

Scale of 100 Yards.

10 20 30 40 50 60 70 80 90 100

pag. 40.

To James Buller Esqr. Member of Parliament for the County of Cornwall this View of the Port and part of the Boroughs of East and West Loo engravd at his expence is most gratefully inscribd by

Wm Borlase.

walls. Here is a ſtone bridge of 15 arches [c]: below this bridge is the Creek, which, thro' a narrow gut, admits the tide, and with it ſmall barks.

One mile below Sand-place, the Loo is joined by another ſtream from the Weſt, called Dulo; that is, the Black Loo, or Water [d]. The diſtrict through which it moſtly runs, is called Dulo, or Duloo pariſh, as 'tis reaſonable to conjecture, from ſome apparent darkneſs in colour ſufficient to diſtinguiſh it from the adjoining ſtream of Eaſt Loo, whoſe whole courſe is at a medium not two miles diſtant. This water riſes in the pariſh of St. Pinok, and coaſting nearly South, becomes navigable at Trelaun wear, about two miles from the Sea; a mile after it joins the Eaſt Loo, and they both paſs the ſtone bridge above-mentioned into Loo Creek; its whole courſe being about ſeven miles. Dulo, or Weſt Loo River.

Fâwy [e] riſes in Fâwy moor [f], at a place called Fâwy Well, in the pariſh of Altarnun, not far from Brownwilly, one of the higheſt mountains in Cornwall [g]. The higher part of this River is alſo called Draines, and the firſt bridge upon it is by Leland [h] called Draines Bridge; after which paſſing three other bridges [i], and having taken into its ſtream the Rivulets of St. Neot's, Warlegan, and Cardinham pariſhes, it comes to Reſprin, aliàs Laprin [k] Bridge, whence, in about three miles, it reaches the borough of Loſtwythyel, where it paſſes a fair ſtone bridge of nine arches, of which the water at preſent only uſeth three. In former ages the ſea ebbed and flowed above this town [l], and Camden ſays brought up veſſels of good burthen: at preſent loaden barges ſcarce come within a mile of it. In three miles more the Fâwy, having taken Pellyn Brook from the Weſt, receives the water of Leryn River and Creek from the Eaſt, and becomes thence a deep and wide Haven: in two miles more it reaches the town and borough of Fâwy on the weſtern bank; and a little below, being joined by Polruan creek and brook from the Eaſt, opens into the Sea, after a run of twenty-ſix miles, betwixt two old towers (built in the reign of Edward IV [m].) from which there formerly ſtretched a chain for the defence of the harbour. This is thought the largeſt body of freſh water, except the Tâmar, in all this county. Fâwy River.

[c] Including two ſquare openings made for the more commodiouſly paſſing boats laden with wood.

[d] Waters oftentimes take their names from ſome remarkable colour, either of the water itſelf, or the ſand or banks which they paſſs by; of which we may ſee ſeveral inſtances from Lhuyd, in Baxter's Gloſſary, page 266.

[e] In Lincoln Taxat. Faue; in Leland, vol. III. page 22, &c. Fawey, rectius Fâwy or Fauy, a fau fovea, & wy aqua; that is, the water of the deep ditch, vault, or den.

[f] "In a very wagmore in the ſide of a hill." Leland, vol. III. page 24.

[g] On the banks of this River are three tenements, called Fauton in maps, but in the records Fawyton, or the Town on the Fâwy. See records of Knights Fees, taken from the third of Henry IV. Carew, page 42.

[h] Vol. III. page 24.

[i] Clobha, Lergen, and Newbridge. Leland, ibid.

[k] Leland, ibid.

[l] Leland, vol. III. page 23.

[m] Ibid. page 22.

River Fal. The next navigable ſtream is the Fal [n], which riſes at a place called Fenton Val, (that is, the ſource of Fal) about two miles Weſt of Roche Hills, and running about eight miles to the South, may be called a plentiful ſtream at the borough of Granpont, where it paſſes under a ſtone bridge that gave the preſent name to this borough, but has nothing elſe remarkable. About a mile below this bridge the River was formerly navigable, at leaſt for boats; but is now deprived of that great advantage; in three miles farther, it reaches the borough and bridge of Tregeny. To this place in the laſt century the deſign of making the River Fal navigable by ſluices up to Granpont was nearly completed by one Colonel Trevanion; but this attempt, ſo much for the benefit of the adjacent country, had no conſequence but what ſhould be mentioned with concern; I mean, that of exhauſting the private purſe of this public-ſpirited Gentleman. A mile below Tregeny Bridge the waters begin to ſpread, and aſſiſted by the tide, and many little brooks on either hand, forms a Creek, about three miles long, called Lâmoran [o] Creek. Here, having waſhed the Southern ſide of the lands and park of Tregothnan, ſeat of the Right Honourable Lord Viſcount Falmouth, it is joined by Truro Creek, a noble body of water to which the Rivers of Kenwyn and St. Allen give the firſt riſe, and meeting at the borough of Truro, make with the tide a navigable chanel for ſhips of 100 ton burthen to come up to the town Kaye. From Truro, after making a ſmall Creek to the Weſt, in two miles it joins St. Clement's Creek, which is navigable for barges, three miles to the Eaſt, as far as Treſilien Bridge. Truro Creek and St. Clement's at their meeting make Môrpas [p] Rode, and proceeding about a mile farther, meet the Fal at the mouth of Lâmoran Creek, whence they all together, under the name of Fal, in two miles more reach the principal branch of Falmouth Harbour, called Carreg Rode; hither flows from the Weſtward Tretheag River, and with ſome other Brooks from the North form Reſtronget Creek [q]. Melor, or Milor Creek is next; ſmall, but ſheltered [r]: then comes the great Creek, or rather Harbour, called King's-Rode, which has Fluſhing to the Eaſt, and the populous town of Falmouth to the Weſt, and is navigable two miles up to the borough and port of Penryn, whither ſhips of 100 ton and ſomewhat more may come up. A little below this laſt-mentioned town, on each ſide of the Creek, there was a jutty head, and, to guard the gap between,

[n] In Leland, Vol. iii. page 17, Fala, unde Coit Fala; that is, Fala-wood; the antient name of Granpont, more antiently ſtill called Vol and Cenio.

[o] The Church of St. Moran, ſays Leland, vol. III. page 17, or, as is more probable, from Moraun, or Morhaun; that is, the River Haven, ſcil: where the River and Sea meet.

[p] That is, the paſſage over the Sea; in Leland, called Maples Rode.

[q] Leland, vol. III. page 16.

[r] Wherein the greateſt ſhipp that ſailes may ryde ſaufe. Norden's Survey of Cornwall, p. 47.

there

there was a chain in the time of Leland [s]; but ſuch unwieldy defences are become in a manner needleſs, ſince the improvements of naval architecture have ſo much advanced the Royal Navy. The Creeks on the Eaſtern bank of this harbour are the little Creek of St. Juſt, and the irregularly wandering one of St. Maudit's; and all theſe branches being united in Carreg Rode, as the ſtem and trunk, (four miles long, above a mile wide, and fourteen fathom deep) the Fal runs into the Sea betwixt Pendinas Caſtle on the Weſtern bank, and St. Maudit's and Anthony Point on the Eaſt: the opening here into the Ocean is near a mile wide, deep chanel, but near the middle a large rock [t], moſt dangerous when the water is moſt deep; for then it is hid. To remedy in ſome meaſure this danger, the heirs of Killigrew, Lords of Pendinas Caſtle, (which guards this entrance) are obliged to keep a tall pole fixed on the higheſt part of the rock. Notwithſtanding this inconveniency, the harbour of Falmouth muſt be reckoned among the moſt ſecure and capacious harbours belonging to the crown of Great Britain. Leland [u] calls it "a very notable and famous, and in a manner the principal haven of all Britain." Camden equals it to Brunduſium, in Italy; and Carew, Camden, and Speed, agree, that a hundred ſail of ſhips may anchor in it, and no one ſee the other's top [w]. Hamoze Harbour, at the mouth of Tâmar, is reckoned to be better ſet off with proſpects of ſeats, towns, and gently declining ſhores, and has a greater ſpace of deep water for the Royal Navy; but Falmouth has a bolder ſhore, is better ſecured with hills and winding creeks for trading veſſels, and its ſituation more convenient for getting clear of the chanel: in ſhort, yielding only to Milford Haven on the coaſt of Wales, it is generally reckoned the ſecond harbour of Great Britain.

This River is called Hêl, and the firſt ford over it Hêlford [x]. The head of it lies upon the hills of Wendron pariſh, near Penhâl Guy (i. e. water coming from the head of the hill) whence it runs, in about three miles, to a village called Guyk [y], whither, by help of the tide, barks come up. A mile farther down the Hêl is joined by Maugan Creek on the South, and three miles farther by Keſtel or Hêlford Creek, where there is a paſſing boat, and at its mouth, three miles farther, by Gillan Creek. On the North it has firſt

Hêl or Heyl River, in Kerrier.

[s] Vol. III. page 15.

[t] Called by Leland, vol. VII. page 111. Caregroyne; that is, "Inſula, vel rupes Vitulorum marinorum;" Anglicè, Seals; or perhaps from Careg, rock, and grûn or Wallicé grwnn, a ridge of land between two furrows (Richard's Dictionary); for ſuch indeed this is: but it muſt be owned, that it is uſual with ſailors to call rocks after the names of animals; as the Wolf Rock, the Cow and Calf, the Shark, &c. from ſome imaginary reſemblance.

[u] Vol. V. page 111.

[w] Carew, 150. Camden, 16. Speed, lib. i. chap. xi. page 21.

[x] Hail and Heil by Leland, vol. III. page 12. and Heyle, Heyl, and Hayl, ibid. vol. VII. page 110. This ſeems to be a common name for a River. On the North Sea we have one in the Hundred of Penwith; on the Alan we have a Church called Egloſhêl; that is, the Church on the river Hêl; and the Alan, near its ſource, is called Cam-hêl, unde Camelford.

[y] That is, Guyik, the Watery Village, or Village on the Guy.

Polpenrith,

Polpenrith, aliàs Polpere, and Polwevorêl Creeks, running up towards Conſtantine Church; and a mile farther down, Chielow, aliàs Calmanſake Creek (Leland III. 13).[z] This haven, within a mile of it's mouth, is ſecure enough for ſhips of 200 ton; and at it's paſſage into the ſea, is about a mile wide.

Lo, or Low River, in Kerrier.

This River riſes in the higheſt Northern part of Wendron pariſh, whence, in about five miles, it reaches the borough of Helſton;[a] about a mile below which it forms a Lake, called the Lo Pool; the River giving riſe to the Lake, and the Lake, as the moſt remarkable part of the Water, giving name to the River[b].

Heyl River, in Penwith.

Four brooks give riſe to this River[c]; and uniting at Relubbas from a Weſtern Courſe, turn to the North, and in three miles reach St. Erth, aliàs St. Ercy Bridge, of three ſtone Arches, and a raiſed Cauſey well walled on each ſide, reaching croſs the valley. The Bridge has been built ſomewhat more than 400 years[d], before which time there was a ferry here, and ſhips of great burden came up to it. The valley, above bridge, has been much raiſed by the ſands and earth, waſhed down from the hills and mines; and the haven below has ſuffered the ſame misfortune, from the ſands of the Northern ſea; ſo that lighters only come within a bow-ſhot of the bridge; and that with the tide of flood, which at ſpring tides flows near a mile above the bridge. Here the land of Cornwall, is at it's narroweſt dimenſion; ſo that from the full ſea mark of Heyl on the North Sea, to the full Sea-mark at Marazion in Mount's Bay on the South Sea, the diſtance is but three miles. From St. Erth the Heyl bears directly North, ſpreading an area of ſand, of half a mile wide at a medium, and two miles long, but navigable only in the chanel of the River, which admits ſmall ſhips a mile inwards from the ſea under the village of Lannant. Near it's mouth the Heyl is joined by a brook from the Eaſt, which, under the Parochial Church of Philac, makes a branch of this haven for ſhips of 100 tons. The Sea has not only almoſt filled this ſmall harbour with ſand, but forms a bar alſo at it's mouth, over which ſhips of 80 and 100 ton only can come in at the height of a ſpring tide; and the bed of the whole is ſo raiſed, that it admits the tide in it only ſix hours in twelve; ſo that whereas, in harbours open to the ſea, the tide flows ſix hours, and ebbs ſix hours: here 'tis

[z] Kilmanach, the Monks Cell; Chielow, or Killow; that is, the cell or houſe on the water or lake.

[a] By Leland called Hailſton, vol. iii. page 12. by miſtake for Hêllas, or Hêl-laſ-ton; that is, the town on the Green River; waters often taking this part of their name from their colour; as Cam-las, the Green Cam; in Merionythſhire, Caernarvonſhire, and Brecknockſhire, Dulas; in Brecknockſhire, Morlâs aqua cærulea; Lhuyd in Baxter, 274. Yr avon las the Green River in Glamorganſhire, ibid page 266.

[b] In Speed, and Camden's maps, and Norden, page 22, this river is called Cober, a miſtake (as I apprehend) for Lober; (that is, the bar of the Lo) a ſandy pebbly bank, thrown up by the ſea at the mouth of this river, and ſerving as a dam to form the Lake.

[c] Leland, Vol. iii. page 10.

[d] Leland, ibid.

otherwiſe;

otherwiſe; the tide has flowed three hours before it can enter Heyl, and it ebbs three hours in the open Sea after the tide has quite diſappeared in Heyl: 'tis therefore but a half-tide haven: yet, notwithſtanding this, 'tis a place of conſiderable trade for iron, Briſtol wares, but more eſpecially Welſh coal, for which at preſent there is ſuch a demand for fire-engines, melting-houſes, and the home-conſumption of a populous neighbourhood, that uſually there are above five hundred, oftentimes a thouſand horſes, which come to carry off coals, for ſome purpoſe or other, ſix days in the week. The fire-engines, which take off the greateſt quantity of coal from this harbour, are ſtill increaſing in number, and the trade here muſt proportionably advance.

Ganal Creek [e] runs up into the land from the North or Severn Sea, as it is ſometimes called, about two miles, where it meets the River, which riſes in the pariſh of Newlan, near Trerice, the paternal ſeat of Lord Arundel of Trerice. This water was more conſiderable formerly, but, like our other little havens on the North Sea, has ſuffered much from the plenty of Sea-ſand, with which the North Channel ſo much abounds, that every ſtorm from the Weſt and North throws it in more or leſs upon the creeks and havens, and in many places upon the hills. At the mouth of the Ganal ſtands a little village, called Carantoc, from the Saint to whom the pariſh Church is dedicated. Tradition ſays, that it was antiently a large town, and very probably it was ſo, the religious houſe here being the reſidence of a Dean and nine Prebends. Sloops of thirty tons only can frequent this Creek.

Ganâl Creek, alias Kanal.

We proceed next to the greateſt River on the North of Cornwall, at preſent commonly called the Camêl (that is, the crooked River), from the many turnings in its courſe, eſpecially from the ſharp angle it makes near Bodman, where, from a South South Weſt courſe of twelve miles or more, it bears for the Sea North North Weſt. It was alſo called in Leland's time [f] Dunmêre; that is, the Water of the Hills; and the bridge over it, near Bodman, is ſtill called Dunmere Bridge. It was alſo "called Cablan in ſome hiſtories [g];" but this is only a contraction of Cabm Alan, that is, the crooked Alan; (not Camblan, as in Camden [h],) the b being inſerted before the m by the Corniſh idiom [i]; for Alan is indeed the proper name *. This River riſes about two miles North of the borough of Camelford, where its banks are famous for two conſiderable battles; the firſt

River Alan.

[e] Kanal, or Ganal, is a word borrowed by the Corniſh from the Latin Canalis, ſignifying a channel, Creek, or narrow arm of the Sea. Thus there is Kanal Idzhy, in the pariſh of St. Iſſy, ſignifying St. Iſſy's Creek; and here is Kanal in a like ſituation. Mr. Lhuyd ſays, that the Corniſh uſe the word Shanol for Canalis (Compar. Etymol. in voce). Here it is Kanal or Ganal, the k being often changed into g.

[f] Vol. VII. page 106.

[g] Says Leland, ib.

[h] Laſt Edition, page 23.

[i] As crobm for crom, &c.

* Leland, ibid.

in which King Arthur received his mortal wound: thus recorded by the Poet [k]:

------ "Naturam Cambela fontis
Mutatam ſtupet eſſe ſui, tranſcendit in undas
Sanguineus torrens ripas, et ducit in æquor
Corpora cæſorum; plures natare videres,
Et petere auxilium quos undis vita reliquit."

The other, a bloody battle, fought betwixt the Corniſh, and the Weſt Saxons of Devonſhire, in the year 824 [l], in which many thouſands fell on each ſide, and the victory remained uncertain. Hence, after a run of about 12 miles, it becomes navigable for ſand barges at Parbrok; and at Egloſhêl [m], receives a plentiful addition to it's ſtream, from the River Laine [n]. A mile farther down, this River reaches the greateſt bridge in this county, called Wade-bridge: about the year 1460 [o], there was a ferry here whilſt the tide was in, and a very dangerous ford when the tide was retired, which moved the then Vicar of Egloſhêl, one Mr. Lovebon, with great induſtry and public ſpirit, to undertake this bridge; a great and uſeful, but tedious work. Beſides the expence, ſo diſproportioned to his circumſtances, in the courſe of the work, there aroſe ſuch difficulties, as might have baffled a more mechanical age than that in which he lived: the ground, for the foundation of ſome of the piers, proved ſo ſwampy, that after repeated efforts another way, they were forced at laſt to build on wool-packs; however, it ſhould never be forgotten, that by his ſollicitations, and the liberal contributions of others, but chiefly by his own perſeverance, and the bleſſings of providence, he lived to accompliſh the bridge as it now ſtands, with ſeventeen fair and uniform arches, reaching quite croſs the valley, to the great ſafety of travellers, and the credit of his country. Hither come up ſmall barks of 40 and 60 ton, and ſupply the country with coal from Wales, with ſlat, which riſes about ten miles off, lime, timber, and groceries from Briſtol. A mile farther down the Alan makes two ſmall Creeks on the Eaſt, in return for a brook or two which it receives; then keeping to the North-Weſt, and ſupplying two Creeks on the Weſtern bank which run up into St. Iſſy, and little Petrock pariſhes, in a mile more it reaches the antient town of Petrockſtow, aliàs Padſtow, where there is a pier, and ſome

[k] In Camden, page 23.
[l] See Saxon chronicle.
[m] That is, the Church on the River.
[n] Some Rivers among the Britiſh, ſays Lhuyd in Baxter's gloſſary, page 273, take their names from animals; as the Caru (Cervus) in Shropſhire, and the Elaine, (Hinnulus) in Radnorſhire, and Montgomeryſhire, &c. probably this River Lain, had the name of Elaine from the ſwiftneſs of it's courſe.
[o] Leland, Vol. II. page 82.

trade

PL. III.

pa. 46

Scale of 100 Yards.

10 20 30 40 50 60 70 80 90 100

To John Molesworth Esqr. this North View of WADEBRIDGE, in Cornwall, engravid at his expence, is most gratefully inscribid by

Wm Borlase.

trade from Ireland, Wales, and the Briſtol channel. Here at Padſtow the Alan is near a mile wide, and there is a ferry-boat to croſs. At the mouth of this harbour, about two miles below the town, the Sea, as in all our harbours on the North channel, has acted againſt itſelf, and thrown a bar of ſand croſs the haven, which prevents ſhips of more than 200 tons from coming in at all, and makes it hazardous even for the ſmaller ſhips to come in, but when the tides are high and the weather fair.

Farther up on the Northern ſide of Cornwall, there is no conſiderble or navigable River; but we find the Creeks of Portiſic, and Botreaux Caſtle, and Bude Haven, which name, the laſt Creek, had it not been formerly a more conſiderable retreat for ſhipping than it is now, could never have deſerved; but indeed, what ſeems antiently to have been the haven, is now all moraſs and meadow ground, reaching from the Barton of Whaleſborough nearly to the town of Stratton, about two miles long, and little leſs wide. In the middle of this moraſs runs the River, which, with the tide, makes the preſent Creek, and opens into the Sea by a narrow paſſage.

Before I take my leave of the navigable Rivers of Cornwall, I cannot help obſerving, that there is ſcarce any one of them ſo deſtitute of water, or ſo diſtreſſed by untoward levels, but that their navigation may be either extended or improved: but ſome improvements are more deſirable as they will be more advantageous to the country, and more eaſily effected than others: their neglect is therefore the more affecting. Lanceſton is a populous town, and in the neighbourhood many families of rank and fortune, and in general the country round is well peopled and cultivated; yet all the coal for firing, fir-timber for building, all foreign products, all goods from London, Exeter, and Plymouth, all ſea-ſand for manure, they are forced to ſend for ten miles at leaſt, and have them all from Morlham or Boſcaſtle, which is ſtill further, by land-carriage, through ways in general egregiouſly bad; difficulties which neceſſarily occaſion little trade, and ſcanty employment for the poor. Now the Tâmar paſſes within a mile and half of this town (a little above Polſtun Bridge) where it is a noble ſtream of water, a wide chanel, and receives the Aterey River coming directly from the walls of Lanceſton: hence the Tâmar ſets to the South, ſo directly, that it is but little more by water than by land. Surely ſo rich and populous a neighbourhood as this, might be well requited for the charge of making, or at leaſt for exerting all their intereſt to make this River navigable at the public expence for the ſhort ſpace of ten or twelve miles.

Another improvement pointed out by nature is, the uniting the Fâwy, on the South Coaſt, with the Alan on the North. Theſe

two

two conſiderable rivers come ſo near each other in the middle of the County, that they almoſt cut it in twain. From Loſtwythyel (where the tide from the South now reaches) to Parbrôk, whither the tide comes up from the North, the diſtance is eight miles; but from Reſprin Bridge, near Lanhydroc Park, to Dunmere Bridge, about a mile from the town of Bodman, (at both which places the ſtreams are conſiderable) the diſtance is but four miles; and in this intermediate ſpace, many leſſer ſtreams occur, which might come in aid, to promote the union of the North and South Coaſts. The advantages of ſuch an union, are too obvious to be particularized, and the difficulties too few to diſcourage the undertaking, whenever a public ſpirit, for rendering rivers navigable, ſhall ariſe in this nation. It is indeed to be wiſhed, that as the eyes of all begin to ſee the advantage of good roads for trade and travellers, ſo they may in time awake, and perceive the greater, at leaſt equal advantage of improving the water-carriage of this nation. Moſt of our creeks are capable of being made navigable higher up into the country, than they are at preſent; and indeed were ſo formerly: and though this might ſeem needleſs here in Cornwall, where the ſea is ſo near us on either hand, yet I think this is a ſtrong argument for, inſtead of being againſt the improvement of our water-carriage; it being evidently of ſo much the leſs difficulty, as the ſpace is ſhort, and of ſo much the greater advantage than making Rivers navigable in an inland country, as the products of the Sea, and the Sea-coaſt commerce, muſt exceed the products of any one inland county. But farther: As nature has denied other manures, ſuch as lime, chalk, marle, or rather art has not yet diſcovered them in any anſwerable goodneſs and plenty, Sea-ſand and ore-weed may be reckoned our principal and moſt prolifick manures; and ſo many of our farmers are forced to carry ſand ſix, eight, or ten miles, and ſometimes more, that in the Philoſophical Tranſactions, April 1675, in a letter to Dr. Daniel Cox, I find the carriage is eſtimated at 32,000l. a year: if therefore we were to receive no other benefit than the ſaving in this one article of Sea-ſand, which ſurely might be reckoned one half of the preſent carriage, it could not be unworthy the publick notice of this County. But many other and ſtill greater conveniencies are obvious, ſuch as bringing up timber and other materials for building, and tin-works, carrying, recarrying, and exporting metals, communicating neceſſaries from London and Briſtol, introducing the products of foreign countries, eaſier conveyance of coal, and wood (with which the ſides of our navigable Rivers are remarkably well furniſhed) for firing. Theſe apparent advantages of improving our navigable Rivers moved ſome worthy patriots of the laſt century to make an eſſay on one particular

ticular River [a], that they might the better eſtimate the expence, and apply more ſucceſsfully for the aſſiſtance of Parliament. Accordingly they finiſhed one lock, with its leat twelve feet wide, which raiſed the water eight feet, at the charge of ſixty pounds. This was looked upon as ſo great an encouragement, that a bill was brought into Parliament to make all the Rivers in Cornwall, whieh were capable of ſuch improvement, navigable: the bill paſſed the Houſe of Commons with great approbation: it was afterwards introduced into the Houſe of Lords with words to this effect; That it was a noble deſign, and might give a pattern for all England to follow *; but it went no farther, it being then but four days to the end of the ſeſſion; and the civil wars of Charles I. ſoon after enſuing, put an end to this beneficial attempt, and deferred the glory of accompliſhing it, till the like ſpirit is happy enough to aſſociate with more power.

It is hinted before, that our Rivers and Creeks were formerly navigable much higher up than they are now: the truth is, the beds of the Rivers are raiſed ſeveral feet perpendicular by the earth, ſand, and gravel from the hills: this is natural in all places, in proportion to the quantity of rain, the declivity of the grounds, and the largeneſs of Rivers; but with us in Cornwall much promoted by digging and ſtreaming for, ſtamping and dreſſing our metals, all performed at the water ſide, and the refuſe all waſhed into the Rivers, thence into our harbours. This is a growing evil, complained of by Leland, and Carew, (page 27) but ſtill unredreſſed; and as there are many more mines now than formerly, the beds of our Rivers will riſe proportionably quicker than in former times, and make it ſtill more difficult to continue the navigation even upon its preſent footing. There was an act of Parliament, made in the 23d of Henry VIII. "that none ſhould labour in tin-works near the Devon and Corniſh havens" (Carew, page 27); and though this act is obſolete, it might poſſibly be re-enacted upon proper application, and be made more effectual to anſwer the ſalutary purpoſes intended.

CHAP. V.

Of the Lakes and Sea of Cornwall.

SECT. I.

AS one general ridge of hills runs through the middle of this County, and the Sea is ſo near on either hand, the rivers, which riſe in the higher grounds, have but a ſhort paſſage to the ocean; and meeting with no conſiderable impediments, few only and ſmall Lakes are formed.

[a] Suppoſed to be the Lynher.

* Letter to the author from J. Frehawk, Eſq;

SECT. II. Dozmery Pool.

Four miles North of the church of St. Neot's, about fourteen miles from Loo, on the South Sea, and as many from the head lands of St. Gennys, on the North Sea, the waters of the hills adjoining gather into a baſon, and make a ſmall Lake of about a mile in compaſs, called Dôzmery Pool[r]: Leland ſays, it was reckoned fourteen or fifteen fathom deep; but Mr. Carew, page 112 (better informed by experience) ſays, that upon tryal, no place in it was found deeper than nine feet, and no fiſh but Eels.

SECT. III. Swan Pool.

Betwixt the pariſh of Budoc, in the Hundred of Kerrier, and that of Falmouth, a ſmall Creek, not half a mile long, nor a quarter wide, is ſever'd from the ſea by a bar of ſand and ſhingle. This is now called the Swan Pool; (from the Swans kept here ſome years ſince by the Killigrews, Lords of the ſoil) but in Leland's time[s], Levine Priſklo, aliàs Levine Pool. The Eels of this water are reckoned extremely good.

SECT. IV. Lo Pool.

The moſt conſiderable Lake we have in Cornwall is the Lo Pool, betwixt the pariſh of Sithney on the Weſt, and thoſe of Helſton, and Maugan on the Eaſt. The Lake is about two miles long, and a furlong wide, formed by a bar of pebbles, ſand, and ſhingle, forced up againſt the mouth of this Creek by the South Weſt winds[t]; the valley here betwixt high lands on each ſide giving vent to, and thereby increaſing the force and velocity of the winds from this quarter. This bar dams up the water which comes down principally from the Lo River, till it comes to a ſtone bridge, (from an hoſpital of the Templars dedicated to St. John) called St. John's Bridge, but is fed alſo in ſome meaſure, by a few brooks below[u]. Scarce a mile below the bridge, the Lake begins to overſpread the whole valley; and in half a mile more, gaining in depth from three to ten feet, makes a little creek into Penrôs: from this creek the pool deepens, and from ten becomes twenty-two and twenty-ſix feet deep, till it is within a furlong and half of the bar, when it riſes gradually from twenty-ſix to ten feet at its brim, being a mile and quarter long, and a furlong wide at a medium. Not being able to proceed farther to the South, the water winds away to the Eaſt, and fills Carminow Creek, half a mile long, and half a furlong wide, at a medium. Theſe are the dimenſions of the Lo-pool in ſummer, the ſuperfluous water draining through the bar into the Sea; but in the winter the whole valley is oftentimes ſpread with

[r] That is, the meeting or coming together of the Lake water, Dôz-mêr-üy.

[s] Vol. III. page 15.

[t] Not the South Eaſt, as Leland, Vol. III. page 110, ſays.

[u] From Penventon and Penroſe on the Weſt, and Nanſlow, Negybma, and Carminow, on the Eaſtern banks.

water

PL. IV.

General Scale of feet for the front of the Houses.

5 10 20 30 40 50 60 70 80 90 100 120.

pa 51.

To Humphry Prideaux Esq.r this East View of PLACE *is most gratefully inscribd near Padstow, Cornwall, engravd at his expence by Wm: Borlase.*

W3. delin. *I.G sculp.*

water from the town of Helſton to the brink of the Sea; and when the town mills at St. John's Bridge have their wheels ſtopped by this ſwelling of the Lake, the Mayor of Helſton applies himſelf to the Lord of Penrôs, and on preſenting him with a few halfpence in a leather purſe, has a right to cut through the bar, that the redundant waters of the Lake may paſs away, and the mills be no longer impeded. "If this bar might be always kept open, it would be a goodly haven up to Helſton [w]." The cliffs round this Lake are moderately high, and betwixt them there is a very diſtinct echo: but the ſame circumſtances which pleaſe and amuſe in a calm, frighten in a tempeſt; and when the South and South Weſt winds from Mount's Bay get in betwixt the ſteep ſides of the Lake, their roaring is heard at a great diſtance, and thought to preſage ſtormy weather. This Lake is remarkable for an excellent and peculiar trout, which will be taken notice of in its place.

Theſe are all the Lakes we have in Cornwall; but it is much to be feared, that we ſhall have more in time, at the two Northern ports; I mean, Heyl and Padſtow: there are ſandy bars already croſſing their mouths, upon which at neap tides the water is very ſhallow; and if a few violent repeated ſtorms ſhould at any time raiſe thoſe ſands above full Sea-mark, (no improbable ſuppoſition where ſand is in ſuch plenty) throwing in ſhingle and ſtones withal, Heyl and Padſtow (to the irreparable detriment of Cornwall) will become what the Lo is now.

SECT. V. The Sea of Cornwall.

The Sea-coaſt ſpreads itſelf along the South and North parts of Cornwall to ſuch a degree, that if we eſtimate the curvatures of the South and North coaſt, and make alſo a juſt allowance for the much fewer curvatures of the boundary towards Devonſhire, we ſhall find, that four parts in five of the out-line of Cornwall are expoſed to the Sea.

This marine ſituation has its advantages; it fills our bays and harbours, makes a number of fiſhing Creeks, brings its native products, ſand, ore-weed, and fiſh, (as well as foreign merchandize) home to our doors in a multitude of places, exports our tin and fiſh with great conveniency, its vapours generate and feed our brooks, and ſoften the air; its cliffs ſo near on either hand facilitate the drains of mines; they alſo open the treaſures of metals, uſeful earths, and minerals, to the inquiſitive eye: in ſhort, the Sea, being on every ſide of us, procures plenty, and promotes trade and employment in many ſhapes utterly unknown to the more inland counties. Some circumſtances however of this our natural ſituation have their

[w] Says Leland, vol. III. page 12.

diſadvantages:

diſadvantages: our coaſt is not only extended greatly in proportion to the area of land, but it has many promontories jutting out on each ſide, which neceſſarily make deep bays, and unhappily augment the diſtreſſes of ſailors in ſtormy weather: another inconvenience of our Sea-ſituation is, that the land ſhooting out ſharp like a wedge into the Atlantic Ocean, ſhips oftentimes miſtake one channel for another, or are drawn aſide from their true courſe by the inequality of the tides. Farther: The irregularity of the tides riſing from the prominency of the head-lands, is alſo increaſed, at the extremity of Cornwall, by the Scilly Iſles, which narrow the channel (whether the tide ſets to the North, or the South); and conſequently, increaſing the velocity of the current, promote a more than ordinary indraught into both channels. The tide of flood at the Land's End riſes on the top of a common ſpring eighteen feet, and from that to twenty-four, according to wind and weather; inſomuch, that in ſtormy weather, from the South-Weſt, it has riſen to the height of thirty feet; but at the common neap tides only thirteen feet uſually, and at a very dead neap it has not riſen above ten feet. During the flood, the tide at the Land's End ſets inward from the South near nine hours; its run is eight hours in moſt places betwixt Scilly and the Land's End; but the ebb continues only betwixt three and four hours. This is a very dangerous ſingularity, if not known, and properly regarded; but the greateſt difficulty of all, which our maritime ſituation lies under, is this; that an accurate ſurvey of our ſhores, and a preciſe determination of our latitude and longitude, has never yet been taken, not ſo much as of the Lizherd, the firſt land uſually made by ſhips homeward bound, and the Southernmoſt point of England, from which moſt ſhips outward-bound to the Southward begin their reckoning: here a falſe ſtep is made at firſt ſetting out, and unleſs rectified by repeated obſervations, it may be of fatal conſequence. To have the longitude and latitude aſcertained at the extremity of the iſland where ſhips begin and end their reckonings, is certainly a matter of the greateſt moment to commerce, and ſhould be performed by a variety of the beſt inſtruments, at ſubſequent times, and by more than one ſkilful hand. This has never yet been done, (ſee before, chap. i.) nor will be probably, but by the interpoſition of the government, whoſe attention and nomination of proper perſons, and proviſion of a ſufficient apparatus of aſtronomical inſtruments, (an expence ſeldom within the reach of a private purſe) this matter, I ſpeak it with ſubmiſſion, ſeems to me exceedingly to deſerve.

Another circumſtance claims the attention of our countrymen; our harbours are generally at the mouths of rivers, and not very diſtant from the hills where they riſe, and of courſe not ſo long or deep

deep as where the rivers and creeks run farther up into the land: they are therefore more apt to be choaked with ſands and rubbiſh than in other ſituations. Too much care therefore cannot be taken that ſhips diſcharge not their ballaſt in improper places, ſo as to obſtruct the navigable channel, a grievance of which many intelligent traders are apprehenſive, as it may affect our Sea-coaſts in time, when a remedy may not eaſily be found out. The higheſt tide, in equal circumſtances, is about two days and a half clear after the new and full moon. The tide is later than at London Bridge one hour and fifty-five minutes. The variation of the needle at the Land's End has for ſome years been reckoned above eighteen degrees Weſterly; but in the month of October, 1757, at Carelew Houſe, on one of the branches of Falmouth Harbour, it was, by a needle of ten inches and half long, found to be nineteen degrees twelve minutes Weſterly. Dr. Halley [x], in the year 1700, found it to be no more than ſeven degrees and a half Weſterly; but whether the increaſe has been regular and gradual, for want of a continued ſeries of obſervations, I cannot determine.

Such is the common ordinary ſtate of our Sea in Cornwall, as to tides, creeks, harbours, and charts; but indeed the tides are greatly accelerated or retarded, not only by the projection of ſo many head-lands, the depths of bays and creeks, and the indraught of the North and South Channels, but by different winds, and yet the moſt extraordinary phœnomenon which has ever appeared on theſe coaſts, as far as I can learn, proceeded from neither of theſe cauſes. On the 1ſt of November, 1755, about two o'clock in the afternoon, the Barometer being at the higheſt I have noted it for three years paſt, Farenheit's Mercurial Thermometer at 54, the ſane pointing to the North-Eaſt in a flat calm, the Sea, about half an hour after ebb, was obſerved, at the pier of St. Michael's Mount, to riſe ſuddenly, and then to retire. This attracted the attention of the ſpectators, and to their great amazement, ten minutes after, the Sea roſe near ſix feet, coming in from the South-Eaſt extremely rapid; it then ebbed away with the ſame rapidity to the Weſtward for about ten minutes, till it was near ſix feet lower than before; it then returned again, and fell again in the ſame ſpace of time, and continued the agitation, alternately riſing and falling, each retreat and advance nearly of the ſpace of ten minutes, till five hours and a half after it began. During this agitation the Seyn-boats, riding at the head of the pier, were whirled ſome one way, ſome another; and the fiſhermen endeavouring to bring ſome boats into the pier, they were hurried in and out of the mouth of the pier, as the

[x] Letter to the author from Mr. Charles Heydon, Math. inſtrument-maker, October 3, 1754.

Sea advanced and retired, with an impetuoſity not to be reſiſted; and yet no life, or boat, or ſhip was loſt. The firſt and ſecond fluxes and refluxes were not ſo violent as the third and fourth, at which time the Sea was as rapid as that of a mill-ſtream deſcending to an under-ſhot wheel, and the rebounds of the Sea continued in their full fury for two hours; they then grew fainter gradually, and the whole commotion ceaſed about low-water. In Penzance pier, three miles Weſt of the Mount, the tide roſe eight feet, and in Newlyn pier, one mile farther Weſt, ten feet high, the water coming from the South-Eaſt, being as it were accumulated by the Weſtern head-lands, which form Gwavas Lake near the laſt-mentioned pier; but no material damage was done at either place. The ſame agitation, though ſomewhat later in the day, was obſerved in the Northern Channel at the pier of St. Ives, where the higheſt water roſe betwixt eight and nine feet, and in Heyl Harbour adjoining, one riſe was ſeven feet, the reſt little more than two [y]. All this while there was not the leaſt trembling or motion of the earth perceived in any parts near us; but on the ſame day, about ten o'clock in the morning, the moſt dreadful Earthquake ever known happened on the Weſtern coaſts of Portugal and Spain. The city of Liſbon was deſtroyed, 30,000 perſons, ſome ſay more, loſt their lives, St. Ubes, Sevil, Cadiz, St. Lucar, Oporto, Faro, were greatly damaged, and many lives loſt. Ships ſixty leagues diſtant from Liſbon, to the Weſt, felt the ſhock in the ſame degree as if they had ſtruck upon rocks. The Tagus roſe from ten and twenty to thirty feet perpendicular, ebbing and flowing ſeveral times, but every time decreaſing; and between the agitations of the Sea, and the violent ſhaking of the earth, the deſolations of that country are not to be expreſſed, and have never yet been exactly eſtimated.

What connexion with or relation to theſe violent convulſions on the Continent our little, and (thanks to Providence) momentary agitations of the Sea on the coaſts of Britain had, 'tis difficult to ſay; but their happening both on the ſame day, and within a few hours of one another, the many repeated fluctuations in the river Tagus as here in Cornwall, by alternate ſwells and ſinkings, the ſhocks felt on the ſame day far to the Weſt by ſeveral ſhips; all theſe circumſtances ſeem to declare very conſiſtently, that what we felt was either the fainter part of that deplorable ſhock at Liſbon, or the laſt expiring efforts of ſome ſimilar ſubterraneous ſtruggles farther to the Weſt and South-Weſt under the Atlantic Ocean. Indeed,

[y] At Swanſea, in Wales, where their tide is later than with us, and the land farther to the North, the agitation, by the accounts publiſhed from thence, was ſome hours later, by which it is more than probable that the momentum of this unuſual agitation had its firſt riſe far to the South of us.

it

To the Hon.ble John Harris Esq.r this Eastern View of **KENEGGY** *in Mounts bay, Cornwall, Engrav'd at his expence is most gratefully inscrib'd. by*

Wm Borlase.

it can ſcarce be imagined, that a ſhock, ſo far off as the coaſt of Spain, could be ſo immenſe as to propagate ſo violent a motion of the water quite home to the ſhores of Britain in leſs than five hours; I ſhould rather think that the ſame cauſe, diffuſed in different portions through the inteſtines of the earth, produced ſeveral ſubſequent rarefactions of the impriſoned vapours; that theſe rarefied tumid vapours affected the Seas and land above them in proportion to their own power, the dimenſions of the caverns they had to extend themſelves in, and the ſuperiour or fainter reſiſtance of the incumbent preſſure. But though at this time no motion of the earth was perceived, nor any noiſe in the air, yet Cornwall can give a recent inſtance of both.

On Friday the 15th of July, 1757, a violent ſhock of an Earthquake was felt in the Weſtern parts of Cornwall.

The Thermometer had been higher than uſual, and the weather hot or calm, or both, for eight days before; wind Eaſt and North-Eaſt. On the 14th, in the morning, the wind ſhifting to the South-Weſt, the weather calm and hazy, there was a ſhower; the afternoon hazy and fair, wind North-Weſt; the Barometer moderately high, but the Mercury remarkably variable.

On the 15th, in the morning, the wind was freſh at North-Weſt, the atmoſphere hazy, being on the ſands[z], half a mile Eaſt of Penzance, at ten a. m. near low-water, I perceived, on the ſurface of the ſands, a very unuſual inequality; for whereas there are ſeldom any unevenneſſes there, but what are made by the rippling of the water, I found the ſands, for above a hundred yards ſquare, all full of little tubercles (each as large as a moderate mole-hill), and in the middle a black ſpeck on the top, as if ſomething had iſſued there; between theſe convexities, were hollow baſons of an equal diameter; from one of theſe hollows, there iſſued a ſtrong ruſh of water, about the bigneſs of a man's wriſt, never obſerved there either before or ſince.

About a quarter after ſix, p. m. the ſky duſky, the wind being at Weſt North Weſt, fell quite calm; about half paſt ſix, being then in the ſummer-houſe at Keneggy, the ſeat of the Honourable J. Harris, Eſq; near Penzance, with ſome company, we were ſuddenly alarmed with a rumbling noiſe, as if a coach or waggon had paſſed near us over an uneven pavement; but the noiſe was as loud in the beginning and at the end, as in the middle, which neither the ſound of thunder or of carriages ever is: the ſaſh caſements jarred; one gentleman thought his chair moved under him, and the

[z] Theſe ſands, when the tide is in, are covered with ten or twelve feet of water; but when the tide is out, afford an area of three miles long, and about a furlong wide, of ſmooth, firm ſands.

gardener,

gardener, then in the dwelling-houſe, (about a hundred yards diſtant from us) felt the ſtone pavement of the room he was in, move very ſenſibly.

In what place the ſhock began, and whether progreſſive or inſtantaneous in the ſeveral places where it was felt, is uncertain, for want of accurately determining the preciſe point of time in diſtant places.

The ſhock was not equally loud or violent. Its extent was from the iſles of Scilly Eaſtward as far as Liſkerd, and towards the North as far as Camelford; through which diſtrict I ſhall trace it according to the beſt informations I could procure.

In the iſland of St. Mary, Scilly, the ſhock was violent: on the ſhores of Cornwall, oppoſite to Scilly, (in the pariſh of Senan, near the Land's End) the noiſe was heard like that of a ſpinning-wheel on a chamber-floor: below ſtairs, there was a cry that the houſe was ſhaking; and the braſs pans and pewter rattled one againſt another in ſeveral houſes in the ſame pariſh. In the adjoining pariſh of St. Juſt, two young men, being then ſwimming, felt a ſtrong and very unuſual agitation of the Sea. In the town of Penzance, in one houſe the chamber bell rung, in another the pewter plates, placed edgeways on a ſhelf, ſhifted, and ſlid to one end of the ſhelf; and it was every-where perceived more or leſs, according as peoples attention was engaged.

At Trevailer, the Seat of William Veale, Eſq; about two miles from Penzance, the noiſe was heard, and thought at firſt to be thunder: the windows ſhook, and the walls of the parlour, where Mr. Veale ſat, viſibly moved. The jarring of the windows continued near half a minute, but the motion of the walls not quite ſo long; and ſome maſons being at work on a contiguous new building, the upright poles of the ſcaffolds ſhook ſo violently, that, for fear of falling, they laid hold on the walls, which, to their ſtill greater ſurprize, they found agitated in the ſame manner; and a perſon preſent, who was at London at the time of the two ſhocks, in the year 1751, thought this ſhock to reſemble the ſecond, both in degree and duration [a].

At Marazion, the next market town Eaſt of Penzance, the houſes of ſeveral perſons ſhook to that degree, that people ran out into the ſtreet, leſt the houſes ſhould fall upon them. In the borough of St. Ives, on the North Sea, ſix miles North of Penzance, the ſhock was ſo violent, that a gentleman, who had been at Liſbon during ſeveral ſhocks, ſaid, that this exceeded all he had met with, except that on the 1ſt of November, 1755, ſo fatal to that city.

[a] Letter from William Veale, Eſq;

At

At Tehidy, the ſeat of Francis Baſſet, Eſq; the rooms ſhook, and the grounds, without doors, were obſerved to move. The ſhock was felt ſenſibly at Redruth, St. Columb, Bodman, &c. along to Camelford, which is about ninety miles from the iſles of Scilly. From Marazion, Eaſtward, it was felt at ſeveral places, in like manner, as far as Loſtwythyel: but at Liſkerd, about ten miles Eaſt of Loſtwythyel, it was but faintly perceived, and that by a few perſons: it was ſtill leſs ſenſible at Loo and Plymouth, "ſcarcely ſufficient to "excite curioſity or fear [b]."

The times of its duration were various. At Keneggy, we thought the noiſe could not have laſted above ſix ſeconds; at Trevailer, not two miles diſtant to the Weſt, it was thought to have laſted near half a minute; in the pariſh of Gwynier, half a minute; at Ludgvan, three miles Eaſt of Penzance, the noiſe was rather longer than half a minute; but the ſhaking felt in the garden, and obſerved in the houſes, ſhort and momentary. In Germo great-work, ſeven miles Eaſt of Penzance, it laſted only a few ſeconds; but in the iſles of Scilly, it was computed at forty ſeconds.

So was this Earthquake felt in towns, houſes, and grounds adjacent; but ſtill more particularly alarming in our mines, where there is leſs refuge, and conſequently a greater dread, from the tremors of the earth.

In Carnorth Adit, in the pariſh of St. Juſt, the ſhock was ſenſibly felt eighteen fathom deep; in the mine, called Boſcadzhil-downs, more than thirty fathom.

At Huel-rith mine, in the pariſh of Lannant, people ſaw the earth move under them, firſt quick, then in a ſlower wavy tremor; and the ſtage boards of the little winds or ſhafts, twenty fathom deep, were perceived to move.

In Herland mine, commonly called the Manor, in the pariſh of of Gwynier, the noiſe was heard fifty-five and ſixty fathom deep, as if a ſtuddle [c] had broke, and the deads [d] were ſet a running: It was nothing like the noiſe of thunder.

In Chace-water mine, the ſame noiſe was heard, at leaſt ſeventy fathom under the ſurface.

At Huel-rith mine, near Godolphin, the noiſe was ſeemingly underneath. I felt (ſays the director of the mine) the earth move under me, with a prodigious ſwift, and apparently horizontal tremor; its continuance was but for a few ſeconds of time, not like thunder, but rather a dull, rumbling, even ſound, like deads running under ground. In the Smith's ſhop the window-leaves ſhook, and the ſlating of the houſe cracked; the Whim-houſe ſhook ſo

[b] Letter from J. Trehawk, Eſq;
[c] A timber-ſupport of the deads.
[d] The looſe rubbiſh and broken ſtones of the mine.

terribly, that a man there at work ran out of it, concluding it to be falling. Several perſons then in the mine, working ſixty fathom deep, thought they found the earth about them to move, and heard an uncommon noiſe: ſome heard the noiſe, and felt no tremor; others, working in a mine adjoining, called Huel-Breâg, were ſo frightened, that they called to their companions above to be drawn up from the bottoms: their moorhouſe was ſhaken, and the padlock of their candle-cheſt was heard to ſtrike againſt the ſtaples.--- To ſhew that this noiſe proceeded from below, and not from any concuſſion in the atmoſphere above, this very intelligent captain of the mine [e] obſerves from his own experience, that thunder was never known to affect the air at ſixty fathoms deep, even in a ſingle ſhaft pierced into the hardeſt ſtone; much leſs could it continue the ſound through ſuch workings as there are in this mine, impeded in all parts with deads, great quantities of timber, various noiſes, ſuch as the rattling of chains, friction of wheels and ropes, and daſhing of waters; all which muſt contribute to break the vibrations of the air as they deſcend: and I entirely agree with this gentleman's concluſion, that thunder, or any other noiſe from above in the atmoſphere, could not be heard at half the depth of this mine. This therefore could be no other than a real tremor of the earth, attended with a noiſe owing to a current of air and vapour proceeding upwards from the earth.

I do not hear of any perſon in theſe parts who was ſo fortunate as to be near any pool or lake, and had recollection enough to attend to the motion of the waters; but it may be taken for granted, that, during the tremors of the earth, the fluids muſt be more affected than the ſolids; nay the waters will apparently be agitated when there is no motion of the earth perceptible, as was the caſe of our ponds and lake-waters in moſt parts of Britain, on the 1ſt of November 1755 [f]: whence this comes is difficult to ſay; whether the earth's boſom undergoes at ſuch times a kind of reſpiration, and alternately emits and withdraws a vapour through its more porous parts ſufficient to agitate the waters, yet not ſufficient to ſhake the earth; or whether the earth, during the agitation of the waters, does rock and vacillate, though not ſo as to be ſenſible to man, is what I ſhall leave to future enquiry.

Earthquakes are very rare in Cornwall; this was but of ſhort duration, and did no harm any-where, as far as I can learn; and it is to be hoped not the ſooner forgotten for that reaſon, but rather remembered with all the impreſſions of gratitude ſuitable to an incident ſo alarming and dangerous, and yet ſo ſparing and inoffenſive.

[e] Mr. John Nancarrow.

[f] Philoſophical Tranſactions, 1756.

CHAP.

CHAP. VI.

Of the Earths, viz. the Soils, Clays, and Steatites of Cornwall.

SECT. I. THE vegetable Soils may be diſtinguiſhed into three ſorts, the black and gritty, the ſhelfy ſlatty Soil, and the ſtiff reddiſh Soil, approaching more to the nature of Clay.

SECT. II. The higheſt grounds are covered with the black Soil, and on the tops and ſides of hills, it is ſo lax and cold, and its ſalts ſo diſperſed by the rain and ſnow, that where it is dry at bottom it bears nothing but ſour graſs, moſs, and heath, which is cut up in thin turfs for firing, or at beſt, ſhort, dwarf, commonly called Corniſh Furze; where the rains have not liberty to run off, bogs (though in Cornwall none dangerous or extenſive) and marſhes are formed: here the Soil is leſs gravelly and deeper, but to be rang'd among the black Soils, and of little other uſe than that it yields a thick brick turf, full of the matted roots of ſedge-graſs, the *juncus*, and other marſh-plants, which, when thoroughly dryed, make a ſtrong fuel. On the banks of the river Heyl, in the pariſh of St. Erth, there is a ſtrong cloſe-grained turf, which I have ſeen cut into glebes, ten inches ſquare, and ſix deep: they were ranged in the ſide of a moorhouſe [g] as regularly, and almoſt as cloſe, as if they had been ſquared ſtones, and made, inſtead of a hedge, a moſt neat wall, if I may ſay ſo, the corners of the ends, doors, and windows, were ſo well turned. This turf has a ſtiff, white, compact clay under the ſpine, which gives it its conſiſtence. In crofts, farther down from the hills, this black Soil ſerves as wintering for horned cattle, bears good potatoes, rye, and pillas, the *avena nuda* of Ray; in fields, barley and oats, and ſerves as paſture for dairy and ſheep, eſpecially rearing young bullocks; but ſeldom turns to any account when ſown with wheat. It is more or leſs charged with gravel, and therefore called by the Corniſh *grouan* (or gravelly), the earthy parts exceeding light, ſo that, in a dry ſummer, the ſun quickly exhales its moiſture; and, in a wet ſummer or winter, the tilled grounds of this ſort have much of the vegetable Soil waſhed away from the grain.

SECT. III. Shelfy Soil. A great part of the Corniſh Soil, eſpecially about the middle of the County, is of a ſhelfy, ſlatty earth. This is reckoned to bear better corn, eſpecially wheat; as alſo a ſtronger ſpine of graſs than

[g] A hutt, belonging to a mine, for the ſhelter of the workmen, and keeping their implements.

the

the black *grouan.* Several parts of the County have their vegetable Soil of this mould, but more eſpecially thoſe lands which run from Padſtow on each ſide the Alan on the North Sea, to Fawy on the South, and thence to St. German's, from which diſtrict the greateſt part of this County's corn does proceed. The greateſt enemy to this porous ſoil is drought; for looſe as it is, and perpetually diſmiſſing part of its moiſture through its ſhelfy foundation, it will yield the reſt to the ſun-beams above, after a long intermiſſion of rain, by which means both the graſs and corn ſuffer; but droughts of any continuance are ſo rare in Cornwall, that the huſbandmen in thoſe parts have ſeldom any reaſon to complain.

SECT. IV. The Loamy.

The reddiſh, Loamy Soil is of cloſer texture, conſequently retains the moiſture of rain, the ſalts it receives from the higher grounds, the putrified parts of plants and animals, and the bounty of manures, much longer than the Soils above-mentioned: it is not indeed ſo ſoon heated and animated (if I may ſo ſay) by the ſun; but as the ſpring and warm weather advance, it retains the influence of of the day, notwithſtanding the interpoſition of the night, in ſome degree, till the day comes on again, and ripens crops much ſooner than the blacker and looſer Soil. This Soil is moſt common on level grounds and gentle declivities.

Theſe three ſorts of Soil are not always equally and ſpecifically diſtinct from each other, but in different places are ſo mixed, that the black partakes more or leſs of the red, the red of the black, and the ſlat of either, or both; neither are they found always in ſeparate peculiar tracts, but oftentimes ſo interlaced, that one, viz. the higher part of a tenement or barton, ſhall be of one Soil, and the lower and more champagne of a quite different. The attentive huſbandman will eaſily diſtinguiſh them, and the diſcreet and induſtrious will appropriate to each of them its proper culture. To the black and ſlatty Soils, ſtiff, earthy, and calcarious manure, ſuch as may warm, ſtrengthen, and conſolidate; but to the red and Loamy, every kind of manure that may looſen, quicken, and open it. Their management therefore muſt be different, and the product and fertility, *cæteris paribus*, will be in proportion to the depth of the ſoil, and as the bottom on which that Soil reſts contributes to remedy and counteract the natural defects of the Soil above: if the looſe ſoil has a cloſe clay bottom, this latter will retain the neceſſary moiſture; and if the denſer and more compact Soils have a ſhelfy, open bottom, this will further its fertility by draining off the ſuperfluous moiſture below. As to the reſt, circumſtances will vary without end, and beyond rule; and where theory cannot reach, experience will decide.

Dr.

SECT. V. Of Fertility in general.

Dr. Plot [h] is fond of attributing the fertility of earth to the warm ſteams ariſing from metals and minerals below; but the ſterility may be great, where metals and minerals abound, of which no place perhaps affords more frequent inſtances than Cornwall; for here the coarſeſt grounds abound moſt in metals, and on the other hand, there is the greateſt plenty of corn, graſs, plants and trees, where no metals or minerals have ever appeared.

To aſſign any one general cauſe of the fertility of the earth, would be to build upon too narrow a bottom; one of the greateſt prodigies of nature is, that earth ſhould aſſume ſo many ſhapes, and nouriſh, and conſtitute ſuch a variety of bodies: we know by experience, that many materials muſt concur, and that ſome are more prolific than others, but by what proceſs, earth is transformed into nouriſhment, we cannot ſo much as gueſs. Earth is the general food and *ſtamen* of all bodies, yet of itſelf we know it can do nothing; it muſt be connected by a cement, or it cannot form ſtone; it muſt be ſoftened and attenuated by moiſture and warmth, or it cannot enter into the alimentary veſſels of plants and animals. By experiment indeed, it appears, that the conſumption of that Earth, in which trees are planted, is not great, nor at all proportionable to the perſpiration and increaſing bulk of thoſe trees [i]; yet muſt not Earth be denied its due ſhare in vegetation; the parts of Earth which conſtitute the ſolids of any plants are extremely fine, and all the water we pour, or rain that falls on plants, is well ſtocked with thoſe fine, earthy parts, now the common maſs in which we plant trees, is for the moſt part Gravel, Clay, and Sand, which promote vegetation, but are too groſs to enter into, and become the conſtituent parts of plants, and therefore cannot much decreaſe in weight or bulk: water muſt therefore be conſidered as the vehicle of more ſolid nouriſhment, and the parent of the fluids: the earths, ſalts, and oils, are the great inſtruments of the increaſe of ſolids. To trace fertility a little farther: When the earth is ſoftened and diluted, heat rarefies and evaporates the mixture; the ſalts contained and diſſolved, are always active, and promote motion; the elaſticity of the air quickens and continues it; the oils ſupple the paſſages, of which ſome are fitted to ſecrete, arreſt, and depoſit the nutritious particles as they paſs; ſome adapted (by the ſame ſecret hand which conducts every part of the operation) to throw off the redundant moiſture by perſpiration: the more earthy mixture compoſes the hard and ſolid parts, and the genial, little atmoſphere of every plant gives ſpirit, colour, odour, and taſte. Herbs and fruit, being thus fed and maturated, make the earth they contain better pre-

[h] Oxfordſhire, page 57, 58, &c.

[i] Dr. Hales's Vegetable Statics.

pared to paſs into the ſtill more curious and highly organized parts of animals. It is eaſy to ſee that this is rather a detail of the ſeveral materials and well-known inſtruments conducing to fertility, than the cauſe; fertility is owing to the concert, fitneſs, and agreement of all theſe (with perhaps ſome volatile, active principle, of which we know nothing at all); but whence that agreement does reſult, how the materials ferment, replace, connect, and invigorate one another, how the veſſels chuſe and refuſe (if I may ſay ſo) in order to produce the fertility deſired, is known only to the infinitely wiſe Diſpoſer of all things, ever attentive to the nurture and ſupport of what he has created.

But to whatever cauſe the fertility of Earth is to be aſſigned, Earth, it muſt be owned, is a moſt fruitful, univerſal element; animals, plants, metals, and ſtones, ariſe out of it, and return to it again; there, as it were, to receive a new exiſtence, and form new combinations; the ruins and diſſolution of one ſort affording ſtill more and more apt materials for the more plentiful production of others: in ſtones and metals, we admire the continuity, hardneſs, and luſtre of Earth; in plants, the ſoftneſs, variety, colours, and odour; in animals, the fleſh, the bone, and yet an infinite number of different fluids, in which this ſupple element can take place; but the greateſt wonder is, that Earth is capable of being ſubtilized to ſuch an exquiſite degree, as by uniting and communicating with ſpirit to perform all animal functions given in charge to it by the ſoul. This is the higheſt and utmoſt refinement which, in this ſtate of being, Earth is capable of; but that it may be ſtill farther refined, in order to be qualified for a future, incorruptible, and more glorious ſtate, is one of the great truths which we owe to Revelation.

SECT. VII. Ocres, Chalk, and brown Earth.

In our mines, we often find the Ochrous Earths of metals, the ruſty Ochre of iron, which we, in Cornwall, call *Goſſan*, the green and blue Ochres of copper, the pale yellow Ochre of lead[k], the brown yellow of tin, and the red Ochre of Biſmuth; theſe Earths we call the feeders of the metals they belong to, and where they are found, the metals are generally, and very juſtly reckoned not to be far off. Chalk is ſcarcely yet diſcovered any where in Cornwall, but I have ſuch a ſample by me (though of a coarſe gritt), brought from the pariſh of St. Clare, as may convince us that more may be found than is imagined upon a diligent ſearch; a lump of ſmooth Earth, brought me from the pariſh of Illogan, of a chocolate colour, was

[k] I have ſome lumps of this from Gwynier downs, which, in its natural ſtate, mixes well with oil, and makes a ſhade betwixt the common light and brown Ochre; neither ſo bright as the former, nor ſo ruddy and warm as the latter; but more upon the pink. This therefore might probably be introduced into painting with advantage, as it is ſolid, and will not fly off (as the painters ſay) as the brown pink, being a tranſparent colour, will.

ſpeckled

ſpeckled in and throughout with a bright yellow Ochre, and a little cineritious Clay: in water it would not diſſolve, nor remain ſuſpended but for a few minutes; when wetted, ſtuck faſt to, and coloured the fingers: I then ground it on a ſtone with fair water, and it made as good warm *beſto* for drawing as that made of the aſhes of the vine branch, giving a fine ſooty colour to paper. After this I ground it with linſeed oil, and upon laying it thick on the canvas, I found it mixed well with white, not at all cracking or flying off, and that it made a colour equal, and even ſuperiour to burnt-umber, which, though a neceſſary colour in painting, is very raw, harſh, and corroſive, and requires much ſkill to ſoften and correct its aſperities; and I am apt to think, that this natural Earth may with great ſucceſs be ſubſtituted in its room; when caſt into the fire, this earth made no more crackling than might be expected from the air incloſed in a porous body: ſprinkled on a red-hot iron, it emitted no ill ſmell: keeping it in the fire till it was red-hot, it was not affected by the magnet, either then or before; but ſeeming to have acquired a little redneſs, I wetted it with water, yet found it ſtill to retain its *beſto* and brown-umber colour. With aqua fortis it made not the leaſt efferveſcence. I never ſaw but one lump of it: it is certainly a valuable earth for painting in oil, as well as in water-colours.

SECT. VIII. Clays.

There are ſtrata of clay for making bricks in ſo many places, that there is hardly a pariſh, ſeldom a large tenement without it, though more generally found in the low and level lands than in the hilly, and not ſo often near the ſlatty Soil as the loamy. Of white clays in Cornwall we have great quantities, and ſome very uſeful. The following are the moſt remarkable which have reached my notice: A white clay there is found in the pariſh of St. Agnes, which has been uſed for making tobacco-pipes; but either not proving ſo good, or not ſo eaſily procured, (as it muſt come from thence by land-carriage) it is at preſent diſuſed; and in the Weſtern towns, where they make great quantities of pipes, the clay is brought from Pool, in Dorſetſhire.

In the tenement of Amalebreh, in the pariſh of Tewidnek[1], twenty feet under the ſurface, there is a *ſtratum* of white clay. Immerſed in fair water, it imbibed the water ſo greedily, that it made a hiſſing efferveſcence, diſſolved eaſily into a paſte, and the water became like milk; after ſtirring, the ſand mixed with the clay ſubſided, leaving three eighths of the glebe ſuſpended in the water. The larger ſands or gravels were tranſparent, about the bigneſs of a

[1] That is, belonging to St. Ewine.

pepper-

pepper-corn, and plainly a congeries of ſmaller cryſtals cemented together into a lump: their angles were ſomewhat blunted, but the ſmaller gravels or ſands were quite angular; mixed with the gravel, was a good deal of leafy talc, which, in the microſcope, appeared as ſo many *laminæ* of cryſtal. The three eighths ſuſpended in the water, and left to ſettle, depoſited an exceeding white clay; it whitens the fingers, ſticks to the tongue, is extremely ſmooth to the touch, taſtleſs, a little gritty between the teeth, owing to the ſmaller grains of talc, which never deſerted the Clay during the depuration. Being of ſo fair a colour, I ground ſome of it with nut oil, but it loſt its whiteneſs, and became fat, and of a dove colour: with linſeed oil it grew much more yellow, ſo that it will not, as a colour, be fit for painters; with aqua fortis it makes not the leaſt efferveſcence, but reſolves into a paſte; put into a fierce fire, and kept there four hours and forty minutes, it neither vitrified nor altered its colour, and acquired no more hardneſs than is neceſſary for paſtils for drawing. As this Clay ſeparates ſo eaſily from its ſand, has much talc, (and therefore will not vitrify) and the pureſt colour, it may poſſibly, both without as well as with its ſand, upon different occaſions, be a very uſeful ingredient for making porcelain; at preſent, in its natural ſtate, it ſerves only to make bricks for ſmelting-houſes, enduring the moſt intenſe fire of the furnace better than any other within equal reach of the workmen. By its diſſolving ſo readily in water, it may be a kind of marle, and uſeful as a manure.

SECT. IX. Trewren Clay.

There is a *ſtratum* of clay not very different from the foregoing in the tenement of Trewren, in the pariſh of Madern: it reſiſts the fire well, and is uſed by the melters for the ſame purpoſe as that above, but is not near ſo white, ſmooth, and ſoft; by burning a ſmall quantity of it, it appears more tenacious, and fitter for ſtone and potters ware, being reduced into a very hard clome by my ſtudy fire. There are many other whitiſh Clays [m] in Cornwall of much the ſame nature as thoſe already mentioned. I have only to remark, that in the heart of the bed of clay found at Amelebreh, there are ſome ſcattered ſtony glebes of red earth, like the Rubrica of Pliny, and the Miltos of the Greeks. I immerſed this ruddle in water, but it would not diſſolve: upon grinding it, the ſtony part was hard and gravelly, but being well ground down with clarified linſeed oil, it made a very good red, and mixed kindly with white, making a good fleſh colour, and though laid on thick on the canvas, would not ſtart, nor alter its colour; ſo that a better

[m] As at Tregonin Hill in Breag, at Treaſſo in Ludgvan, in the pariſh of St. Enodor, and near the town of Loſtwythyel, &c.

red

red, for all the purpoſes of red Ochre, cannot well be expected to come from the ground. It may ſeem ſomewhat ſtrange that glebes of Earth, of ſo red a colour, ſhould be found ſcattered in a body of clay ſo white and pure; but nature, as well under ground as above, is ſtill various; and the more we proſecute our reſearches, the more ſubjects we may expect to meet with which will excite our admiration, and convince us of our ignorance. One thing however may be obſerved, that theſe red and white clays are very different in nature as well as colour; one, viz. the red, mixing well with oil, and not with water; the other, as greedily imbibing water, and not enduring oil. If theſe ſo different ſubſtances therefore are now found in their original beds, as is moſt likely, the red muſt have been repelled on all ſides by the white, and compacted together by the attraction of its own ſimilar parts.

SECT. X. St. Kevran Clay.

In the pariſh of St. Kevran there is a yellow clay, which, for caſting ſilver, braſs, or lead, is reckoned to exceed every thing of its kind in theſe parts.

SECT. XI. Lannant Clay.

In the pariſh of Lannant there is a yellow clay much coveted for building furnaces: 'tis carried off to Briſtol and Wales, and other places, in ſuch quantities every year, that Humphry Mackworth Praed, Eſq; owner of the Soil, makes above 100 pounds *per annum* of this clay, *communibus annis*; and from January 1757, to Midſummer following, received for it 150 pounds. Bricks made of this clay melt and vitrify in the fire, running into one ſolid body; but afterwards never ſtir till quite calcined, enduring the moſt intenſe fire beyond any bricks uſed for like purpoſes.

SECT. XII. Ludgvan Clay.

There is a yellow ſandy clay in the Vorlas, near the Long Bridge, in the pariſh of Ludgvan, good for bricks and plaiſter; and in ſome parts of the ſame pit, a fine blue clay, which, being well mixed with white, (ſuch as the Amalebreh before-mentioned) makes an excellent lute for aſſaying. This blue clay vitrifies preſently, but the white will ſcarce vitrify at all; neither of theſe clays is therefore proper for luting the crucible ſeparately taken, but mixed they correct one another, and there is no better compoſition for the aſſay furnace.

SECT. XIII. Liſkerd Clay.

Near the borough of Liſkerd there is found in great plenty a yellow ſlatty clay of a fine earth; it feels and cuts ſmooth, and with a good poliſh, and the colour was as fine to the eye as the Naples yellow*; but, upon tryal, it would not mix with oil; it grew fat and greaſy; it is therefore a ſteatites. It is good for graſs; for a

* A light beautiful yellow earth, much eſteemed in painting.

gentleman having made a walk, and laid this clay as a cement, found the graſs to grow moſt plentifully: it might prove perhaps, upon farther tryal, a marle, as proper for corn as graſs; but the uſefulneſs of marle is little known in Cornwall.

SECT. XIV. Steatites.

There is a white ſteatites*, in the pariſh of Guenap, of a more indurated Earth than the former: but the moſt curious of all our clays in Cornwall, is the ſteatites near the Lizherd, generally called the Soap-rock. As the ſituation of this curious foſſil, and its poſition in the Earth, has been wholly miſtaken°, I ſhall be the more particular as to the place and other circumſtances. The firſt place where it appears, is at Kynans Cove, one mile and half North-Weſt of the Lizherd: here is very little of the ſteatites, and ſo far are the cliffs from being compoſed of it, that it was with difficulty we found any; but 'tis rare to find a place where a Naturaliſt would have been more delighted, if he had found none. The way down from the hill is extremely rough and narrow, there being but a path of few inches tread, made by the horſes which carry ſand; from this path you enter a moſt lonely cove, the ſand of which is of a mixed colour, partly light-blue, partly glittering. Theſe ſands are diſperſed in many turning and winding paſſages among rocks and vaſt maſſes of cliff, which the ſea has unfooted and ſeparated from the high-lands adjoining. The ſandy walks lead to many grotts, which are poliſhed too often by the tides to afford any cavernous plants; but at the foot of the rocks, many baſons or baths of cryſtal water are formed in the ſands by the eddy of the waves. There is ſprinkled in ſome places a ſmooth *unctuous* incruſtation, much like bees-wax to the eye and touch, of which the crevices in the rocks (generally no wider than the twentieth of an inch) are full. This incruſtation does not appear to be any exſudation through the pores of the rock, but rather waſhed out of the crevices, and returned by the waves, till it ſticks faſt, and forms a kind of enamel upon the ſides of the rocks. On the Eaſtern ſide of this cove, the rocks in general are more gritty and crumbling, and between them ſome few and ſmall veins of the white and red marbled clay, one ſort of that which we call Soap-rock. But the pureſt and greateſt plenty of the ſteatites is about a mile farther to the North, where deſcending into a narrow valley, about 200 paces from the top of the hill, we found, on our left-hand, a ſtraw-coloured, ſoft, greaſy clay, mixed with brown-red, laid bare by the tumbling-down of the green ſod which covered it. This courſe of clay was about a yard thick, eaſily cut

* Steatites is a clay called ſo from its reſemblance to tallow; in Greek, στεαρ.

° "A conſiderable part of the cliff, near the "Lizard-point, conſiſts of this earth." Woodward's Cat. vol. I. page 6. "The cliff of the "Lizard-point is almoſt wholly compoſed of it, "and the adjacent little iſlands abound with it." Hill's Hiſt. of Foſſils, page 22.

by

by a knife, and compreſſed by the hand; as we walked a few yards farther down, the left hand cliff became a perpendicular ſolid face of black hard ſtone, at the foot of which was a channel or vein about eight feet over, of the ſteatites, of different colours, milk-white, ſtraw coloured, and veined with green, ruddy, and purple. There are alſo in this wide courſe, ſeveral ſtony ſubſtances, of no affinity to the ſteatites: as we came farther down, and nearer to the level of the ſea, we obſerved the vein of ſteatites, contracted into a courſe fourteen inches wide, but of more uniform conſiſtence, the ſolid rock making a ſmooth wall for it on either ſide: there is a ſmall vein or two more in the ſide of this cliff, and the ſeveral ſorts of ſteatites, contained in all the veins, which I have examined here, and at the forementioned cove are as follow:

SECT. XV. Different ſorts of Steatites.

N°. I. The pure white, is a cloſe-grain'd gloſſy clay, diſſolves ſoon in water, is taſteleſs, ſticks a little to the tongue, depoſits a yellowiſh pulpy ſettlement at the bottom, above which a cloud of the fineſt parts continues ſuſpended; mixed with oil, it becomes greaſy; 'tis alſo too fat to make a body of colour for painting in water, and makes no efferveſcence with aqua fortis. It is very abſorbent, and takes ſpots out of ſilk, without injuring the colour, and is poſſibly the ſame, which Biſhop Pontoppidan calls the "white Talc-ſtone, "of ſuch a whiteneſs, that it is uſed in Norway for powder, as it "may be pulverized into an impalpable fineneſs." This is carefully ſelected from the other ſorts of clay, barrelled up, and almoſt wholly engroſſed, by people employed under the managers of the porcelain manufactures.

N°. II. A white, dry, chalky earth, ſticks ſtrongly to the tongue, taſteleſs, diſſolves eaſily in water into a pulp, with acids makes no efferveſcence.

N°. III. The ſame chalky earth equally mixed with a red earth; its water ruddy, like red chalk; its depoſit more gritty than the foregoing: makes no efferveſcence with acids.

N°. IV. The next ſort of this clay is very white, clouded here and there, but not veined, with purple. It diſſolves in water with more difficulty than N°. I. and tinges the water with purple; as to the reſt agreeing in all its properties with N°. I. This is probably the *cimolia purpuraſcens*, or *ad purpuriſſum inclinans* of Pliny, lib. xxxv. chap. xvii.

N°. V. A gloſſy, pearl-coloured, hard clay, approaching nearly to the conſiſtence of a white opaque ſpar; ſoon cleaves itſelf into granules when immerſed in water, yet diſſolves no farther; but with water grinds ſoon into a fleſh-coloured milky pulp: 'tis much harder than ſoap and wax, ſaws free and greaſy; there is a more ſtony variety of this

this clay, and more ſpeckled with purple, ſo that you can ſcarce break it with a hammer; and I find that the more there is of the purple in any ſample, the more hard, and leſs ready to diſſolve in water. But the moſt curious of this ſort, which I have ſeen, was diſcovered here in 1755; it is of a texture ſo cloſe and fine, that after it is cut or ſcraped, it remains as ſmooth, and of as high a poliſh, as the beſt porcelain does after it is burnt. It has an incruſtation of green amianthos on the ſide of the lode, which in my ſpecimen was the twelfth part of an inch thick; and is the moſt beautiful foſſil of this kind I have ſeen. This may be the Galactites of the ancients, at leaſt it is much of the ſame nature.

N°. VI. A fat maſs of ſteatites, its coat or ſkin about half an inch thick, of a waxen texture, of a brown-yellow or deep amber colour, it's interiour ſtrong purple, interlaced with a paler, more cinereous purple, the whole veined with a whitiſh ſteatites, exactly as to the exteriour, like the purple Plymouth marble; it diſſolves into a pulp ſooner than the foregoing number.

N°. VII. In the lode (or vein), near the top of the cliff, I find a kind of green gritty chalk, which may be compreſſed with the graſp of the hand, divides in water eaſily, and diſſolves into a clammy pulp. In the more regular and contracted lode below, I find the green making a ſtony courſe of about an inch wide, its taſte brackiſh; immerged in water, it divides into angular granules; it is the moſt ſolid and hardeſt of any yet mentioned, whence I conclude that the green ſteatites, which is tender, gritty, and pulpy above, becomes more compact in the contracted vein below; its parts attracting one another more forcibly where they have not room to ſpread into a looſe incoherent ſtate, conſequently the narrower the mold, cleft, or vein, the more cloſe, hard, and ſtony the included ſubſtance becomes; and if this ſtone proves harder ſtill underneath, as is not unlikely, it will thereby become the more valuable °.

N°. VIII. A deeper purple, and more ſtony ſteatites, from the ſame cliffs; but whether from the principal lode, uncertain. It has ſo much of the nature of ſtone, that it does not ſwell, nor decompound in water, as the foregoing numbers. Being ſo ſtony, I tried to get a good colour from it by grinding it in oil; it was very difficult to bruiſe, but when ground fine was too greaſy for painting.

N°. IX. A blackiſh kind of ſteatites, the vein about an inch thick, it's exteriour ſmooth and gloſſy, it's interiour veined and ſpotted with N°. V, its texture cloſe, corneous, and approaching in the main to a dark flint, and as hard as flint it was to grind, but it will not give fire with ſteel; being ground down it became of a good

° This ſort approaches very near to the Morochtus of the ancients, Hill's Catalogue, page 22, N°. XII. Perhaps it is ſome of the green Amianthos.

burnt

burnt umber colour, but, like the reſt, too fat for painting. This is however much coveted, and barrelled up for London, the reaſons concealed, but for the porcelain likely, or glaſs manufacture, or both. In the ſame vein there is a ſmall courſe of real ſpar (very unuſual in our Corniſh lodes) about three fourths of an inch thick, N° X. This ſpar lies not in a ſolid lode, but in a ſhattery teſſellated ſtate, like ſo many dies, looſe and ſide by ſide; it ferments immediately with aqua fortis; is ſubtranſparent, and breaks into quadrangular priſms, the baſe a Rhombus.

Theſe are all the ſorts of this foſſil, which I have diſcovered near the Lizherd, and in Cornwall we call the products of all theſe veins Soap-rock, and though the tender clays can with no propriety be called ſo, yet indeed, the three laſt ſorts may be as properly termed ſo as ſteatites, they having no more of ſuet in them than they have of ſoap. Both names are equally founded upon the exteriour.

Of this foſſil learned men have thought differently, and given us very different accounts, owing, as I ſhould think, to their not being ſufficiently furniſhed at one and the ſame time with the various ſorts which theſe cliffs afford. Dr. Grew, in his Muſæum, R. S. page 321, ſeems to have had before him only N°. VI. which has indeed all the colours, white, red, purple, and green, (the purple predominant) is hard as ſuet, and has ſtriated fibres, like the Amianthos.

Dr. Woodward, in his Catalogue of Foſſils, vol. I. page 6. has faintly deſcribed N°. IV. VI. VIII. but it muſt not be denied, that he firſt recommends, at leaſt as far as I have ſeen, this foſſil earth for the porcelain manufacture [p]. Dr. Hill (Natural Hiſtory of Foſſils, page 22) has more fully noted the properties of the laſt-mentioned numbers, but ſeems to have had none of the reſt in his reach, as is evident by his giving the general name of *Cimolia purpuraſcens*; whereas ſeveral varieties have not the leaſt purple tincture. Another learned Naturaliſt thinks he can prove it to be the Parætonium of Pliny, (lib. xxxiii chap. 5) not the Cimolia, and indeed it is moſt likely that the white and pureſt N° I. may be the Parætonium; but I do not, I muſt own, ſee the uſe of diſputing, what was the Cimolia, or any other earth, clay, or ſtone of the ancients, for it is well known, that one ingredient, or property either quite omitted, or not well characteriſed, will throw us into an uncertainty whether things are the ſame or not; beſides, the deſcriptions of the ancients are not always ſo well underſtood (if they were at firſt accurate) as to be deciſive, and in climates and ages ſo diſtant, many things may appear to be like, which are eſſentially much otherwiſe. Such diſputes

[p] Ibid.

therefore, may be of conſequence to modern ſyſtems, but to real natural knowledge, of very little importance; for if ſuch earths are not the ſame with thoſe deſcribed by the ancients, this will not diſcourage the moderns from experiments upon all ſpecious, likely earths; and if they really are the ſame, yet literary deſcriptions are ſo eaſily miſtaken, that no cautious phyſician, ſkilful painter, dyer, poliſher, or other artiſt, will apply thoſe earths, clays, or ſtone, to the uſes aſſigned by the ancients, without making ſuch particular and accurate tryals of thoſe ſubſtances as they may depend upon.

SECT. XVI. Uſes of the ſteatites.

As to the uſes of this ſteatites, that it is abſorbent, and takes ſpots from cloth and ſilk, has been already mentioned in the account of N°. I. and if the other harder ſorts of it were pulveriſed and reduced to a paſte, is doubtleſs true of all: but this is not owing to any ſoap in its compoſition; for as it has neither oil nor ſalt [q], it can be no ſoap: it is owing to the attraction of its parts, which will imbibe greaſe, oil, and unctuous mixtures, in the ſame manner as Fuller's earth, when it cleans ſtuffs and woollen cloth of the like impurities. It is very good for poliſhing.

Soap-earth is in great eſteem in the bagnios of Barbary for cleanſing and ſoftening the ſkin; but whether found in veins, or in a more diſperſed ſtate, this learned gentleman [r] has not mentioned.

Near Smyrna there is a fine whitiſh ſoap-earth, which bubbles up, and boils out of the ground an inch or two thick above the ſurface. Of this earth, boiled with oil, they make, at Smyrna, ſoap in great quantities, annually employing 10,000 kintals of oil in that manufacture, and a thouſand camels every day in carrying off this ſoap-earth: but I would obſerve, that if our earth could anſwer the ſame purpoſe (for, though it is not ſoap, it may prove a proper ingredient for making it) we have not oil in plenty ſufficient for ſuch a manufacture. The principal property of our ſoap-earth is, that it withſtands the fire in a wonderful manner; and though, when taken out of its bed, it appears in ſo many different colours, yet the ſcrapings of every kind (excepting the moſt ſtony numbers, VII. VIII. IX.) are white, gloſſy, and tranſparent, and become whiter ſtill in the fire; it is owing to the different portions of talc and amianthos which it contains, that this earth prevents vitrification, and makes porcelain ware more tough and tenacious. But what are the particular effects of fire on this clay, and how the ſorts are to be mixed, can only be learnt from long and daily attendance at the fires; and the makers of porcelain ware muſt be much better ſkilled in this, than a few trials can poſſibly make the beſt aſſayer. I will

[q] Letter from Dr. Gronovius of Leyden to the author, in 1737.

[r] Shaw, Trav. page 236.

only

only obſerve, that if theſe veins of the ſteatites were dug deeper, and ſearched more effectually, the ſtony ſorts might be found in larger maſſes, and not ſo ſhattery as they are now, (and moſt other ſtones indeed are near the ſurface) if ſo, they would make very pretty vaſes, &c. at a ſmall expence: in particular, N°. V. would make a fine ſubſtance for ſmall buſts and heads; and the green ſtone, N°. VII, might yield a kind of ſerpentine marble at a proper depth, it being in ſome parts of the cliff exceeding hard, and not near of ſo firm a conſiſtence any where above, as it is ſome fathoms lower down in the vein [s].

That this, as well as other clays, is ſtreaked and variegated, is owing to the mixture and inſinuation of differently coloured, moiſtened and diſſolved portions of earth. Hence the various colours of veined marble, colours inſerted, during the liqueſcent ſtate of marbles, by the concourſe of differently ſhaded earths. Some are fond of attributing the different ſtreaks in clays to ſome mineral underneath, which ſends up its ſteams, and ſo changes and impregnates the clay [t]; but if theſe ſtreaks do not exhibit any proof of a mineral impregnation, as I imagine they oftentimes do not, then theſe variegations cannot be owing to the cauſe aſſigned; and indeed, even where theſe ſtreaks appear to be impregnated, I ſhould rather chuſe to attribute the alteration to the mineral or metallic particles brought downwards by rain or brook, than upwards by ſteam; for though mineral ſteams will riſe into the air and water, and the vacuities of ſtone, yet this aſcent cannot be copious enough to impregnate bodies of clay ten, twenty, and thirty fathom deep: the truth is, we cannot always ſay what particular colours are primarily owing to; but we find by experiment, that portions of different coloured earth, reduced to a thin paſte, poured gently into one veſſel at different times, will produce veins and eddies in clay; and doubtleſs the ſame proceſs gave the ſtreaks to clays and marbles.

CHAP. VII.

Of the Sands in Cornwall.

CORNWALL, ſurrounded as it is on the South, Weſt, and North, by the Sea, has perhaps a greater variety of ſea-ſands than any County in Great Britain; ſo many ſandy coves it has on

SECT. I. Sands, the ſorts and origine.

[s] Since my writing the above, I find the following paſſage in Biſhop Pontoppidan's Natural Hiſtory of Norway, Part i. "Of the dark-green "talc, which is likewiſe uſed for caſting variety "of figures, I have ſeen images, and other kinds "of ſculpture with as fine a poliſh, and in every "reſpect as ſightly, as if of marble or ſerpentine; "yet the latter would have taken up thrice the "labour and time, for the talc ſtone, eſpecially of "a good kind is worked much eaſier than wood "itſelf."

[t] Dr. Plot, Oxfordſhire, page 58, &c.

every

every ſide, and the ſands generally different from one another: but before we come to examine the ſands in Cornwall, their varieties, and the uſes they are put to there, ſome particulars relating to ſand in general, it's origin, ſhape, and places where we find it, will deſerve our enquiry.

By ſand we mean a looſe incoherent congeries of pebbles, of no certain uniform ſize or figure; tranſparent more or leſs, of various colours, uſually turning red in common fire, and in ſtrong fire reducible into glaſs.

SECT. II. Natural.

I ſhall conſider ſands either as natural or factitious. By natural ſands I mean thoſe, which have been in the ſame, or nearly the ſame ſtate from the creation, diffuſed through all parts of the earth. Sand viewed in a microſcope is no more than a parcel of little ſtones, doubtleſs therefore they muſt have begun to exiſt, and been formed by the ſame laws that ſtones were formed by; now ſtones were formed at firſt into hard ſolid maſſes, in proportion to the quantity of ſimilar materials and proper cement, and as they were divided more or leſs by diſſimilar adjacent bodies; where there was a great quantity of lapideous particles and few heterogeneous mixtures, there ſtrata, rocks, and large ſtones were formed; but where the lapideous particles were more ſcattered and diſunited by the intervention of other bodies, there ſmall rubble, ſtones, gravel, gritts, and the ſmalleſt and moſt numerous of all ſtones, ſand, did coaleſce into thoſe minute glebes which we at preſent find them in. This probably was the proceſs in every part of the earth; ſo that ſand is one of the primœval bodies, concreted at the ſame time with ſtones upon the higheſt mountains, as well as in the valleys, and at the bottom of the ſea, as well as upon dry land. Without queſtion, theſe minute portions of ſtone, which we call ſand, were at firſt of as different textures, hardneſs and ſoftneſs, as the reſt of ſtones, and from the ſame cauſe; but thoſe of a ſoft and tender ſubſtance, became, in proceſs of time, reſolved into their earths, whilſt thoſe of a firmer ſtructure, ſuch as ſpar, flint, and cryſtal, ſubſiſt to this very day, and are the preſent ſands and gritts.

SECT. III. Factitious ſand.

Beſides this natural ſand, there is alſo a factitious one, which owes its origin to the fretting of river or ſea-water; for water, always in motion, preys upon the ſtones, and grinds them by degrees into that ſtony powder which we call ſand: hence it is that the ſand of a particular ſhore, cove, or bay, has generally the ſame colour, and in a microſcope the ſame ſtructure as the rocks and ſtones of the adjacent cliffs, and the ſtrata under the ſea, upon which the waves are perpetually working, and driving in to the ſhore what they daſh off from

from thoſe ſtrata. Hence the ſands at Ch'andour creek, near Penzance, and thence to Marazion, are of a pale-blue colour, like the rocks at Ch'andour, and the ſhingle on the ſtrand; and on the iſlands of Scilly, it is a bright-coloured ſhining ſand, made for the moſt part of the talc and cryſtals of that granite, commonly called Moorſtone, which edges all theſe iſlands; and the ſame may be ſaid of moſt other parts of Cornwall, where we have ſands, reddiſh, yellow, bright and blue, according as ſtones of each particular hue prevail in the lands adjoining. This factitious ſand is ſo like the natural, that it is extremely difficult to diſtinguiſh them one from another; and it is very likely, that they may have been ſo mixed at the time of the Deluge, that the factitious is often taken for the natural at land, and the natural as erroneouſly reckoned among the factitious on the banks of rivers, and on the ſhores of the ſea.

SECT. IV. Shape.

In ſands there is no uniformity of ſhape: every ſort conſiſts of particular ſands of various ſhapes; ſome round, ſome angular, ſome nodulous; nay, what is more extraordinary, the ſea-ſand, which may be ſaid to be in perpetual motion, has, notwithſtanding this, innumerable little angular points, as if it had never been in the ſea at all; and the ſands about London, and in Northamptonſhire, Oxfordſhire, and the midland counties, have abundance of particles almoſt globular, which would make one believe, that they had ſuffered the agitation of the ſea. Having compared a ſmall kind of moorſtone ſand, found among the white clay of Amalebreh [u], three miles from any ſea, with the ſea-ſand of Scilly, I rather thought the land-ſand more angular than that of the ſea, and it felt rougher; but the difference in the microſcope was inconſiderable; ſo that the difference in ſhape, betwixt ſands of the ſame ſize, is not deciſive or characteriſtic: the truth is, the ſmaller the ſand, the more it eſcapes the trituration of the waters, and the purer and harder the cryſtal is of which the parts are compoſed, the leſs is the attrition, and *vice verſâ*. Upon viewing the larger ſort of Amalebreh ſands, I find them full of little angular proceſſes forming gritts, which do not appear to have undergone any diminution; but upon viewing the larger ſea-ſands, their extremities are all obtuſe, plainly manifeſting, that they have been rounded by the force of waters. As to the oval and globular ſands, found at land, whatever cauſe it was that formed flints and pebbles into a round or nodulous figure (which, in the chapter of the formation of ſtones, we ſhall more properly enquire into) formed alſo the ſame figure of thoſe ſands which we find at a great diſtance from the ſea and rivers.

[u] Mentioned before, page 63.

SECT. V. Place.

But the uncertainty ariſing from the ſhape of ſands is ſtill increaſed by the variety of places in which we find them, and the different manners in which they are diſpoſed in their ſeveral places. There is ſcarce any vegetable ſoil or clay but has its portion of ſand, hardly a gravel-pit, though in ever ſo inland a country, but has ſand in it: many ſtrata of ſtone have ſome ſand above them. Great part of the bottom of the ſea is covered with ſand; the ſhore is fringed with it, eſpecially where the brim of the ſea is ſhallow, and the ſtrand does not dip too faſt: and ſome countries, not only on the borders of the ſea, but whole regions, for ſome hundreds of miles, have nothing but this dreary covering *, and are therefore called the Deſarts. We find it alſo in courſes and ſtrata ſometimes; but what is moſt ſurprizing of all, we find thoſe ſands, which undoubtedly came from the ſea, in ſtrata or layers on the tops of the higheſt hills. The queſtion, well worthy of every Naturaliſt's enquiry, is, How ſands came to be ſo univerſally and yet ſo irregularly diſpoſed? I ſhall confine myſelf to the moſt remarkable appearances of ſand in this county. Sand, in our vegetable ſoil and clay, is common every where, and may be reckoned among natural ſands. In Cornwall the natural ſea-ſand is found in much more plenty in the north chanel, than in the South: from the mouth of Heyl, in Penwith, along to Bude-haven, Cornwall has loſt a great deal of arable ground on the Northern coaſt by means of the blown ſea-ſand, which is ſtill increaſing in the pariſhes of St. Ives Lannant, Philac, Gwythien, St. Agnes, Piran Sand, Carantoc, Cuthbert, Padſtow, and the ſand ſpreads every where but where the height of the cliff protects the lands from its invaſion. On the South we have no lands over-run by the ſand; ſo that either a greater quantity of it is lodged by nature in the north chanel than in the South, (one part of the bottom of the ſea being as naturally liable to be more ſandy as to be more rocky than another) or the river Severn brings down, with its muddy waters, a great quantity of earth and natural ſand; the earth is diſſipated, or reſts in ſheltered beds, the ſand is driven by tide and wind upon the ſhores, and thence upon the land. In the South chanel there is no ſuch quantity, or at leaſt ſuch a continual accretion of ſand; and therefore no ſuch deſolation.

SECT. VI. Some quick, and why.

Of Sands on the ſea-ſhore, ſome are always quick and dangerous, ſome are only occaſionally ſo. Thoſe ſands which are always ſinking and unſafe to tread on, conſiſt of a layer of ſand ſpread on the tops

* As in Arabia, Lybia, &c.

of

of bogs [x]; and where this covering is thin, the ſands are dangerous in proportion to the depth of the bogs underneath. Where the ſands are only quick at particular times, as at Heyl in Penwith, and on the ſtrand betwixt Penzance and Marazion, and elſewhere, the alteration is owing to wind and ſea: in calm weather, ſands ſettle, grow firm and compact; but a violent ſtormy ſea will ſtir and ſhift the *ſtratum* of ſand, condenſe and accumulate it in ſome places, and in others leave the *ſtratum* ſo rare and diluted, that it cannot bear the weight of man or horſe, which muſt therefore ſink into thoſe places whence the ſand is diſperſed, till they come to that which has not yet been moved by the ſtorm.

SECT. VII. Some in ſtrata.

In ſome places, but particularly in the pariſh of Conſtantine, in Cornwall, may be obſerved a *ſtratum* of gritty large-grained ſand, ſpread under the vegetable ſoil, on the top of the *ſtrata* of moorſtone; for that our moorſtone lies in *ſtrata*, notwithſtanding any aſſertions to the contrary, will be ſufficiently proved in the following pages. This ſand is exactly of the ſame colour and ſubſtance as the moorſtone below it; ſo that, till it is ſtirred from its natural poſition, to the eye it appears as moorſtone. Some Naturaliſts have ſuppoſed this ſand to have been fretted off from the moorſtone, on which it lies, by the waters of the univerſal Deluge; but (ſuppoſing the waters of the Deluge of ſufficient force to have effected ſuch a ſeparation, which is far from being agreed upon) upon examination, theſe ſandy particles in a microſcope ſeem too ſharp and angular to have undergone ſuch a trituration: beſides, they are not placed ſpecifically, as to weight and ſize, with large rounded pebbles intermixed, as they would have been if they had been ſeparated from the ſurface of ſtones, and afterwards depoſited by the waters of the Deluge: I ſhould therefore rather imagine theſe ſands to have been natural, and ſome of the primary concreted materials of which moorſtone appears to have been formed, and that moorſtone conſiſts only of the ſame grit, cemented into ſtone by a cryſtal baſis; that the baſis, which forms all ſtone, was more abundant below in the bowels of the earth, than near the ſurface (as appears by the generality of foſſils being of a more compact conſiſtence the deeper we dig) [y]; that, from a deficiency of this cement or baſis near the ſurface, as well as the interfering powers of air, heat, and cold, this ſandy grit never was fixed into ſtone, but always remained in the preſent incoherent ſtate.

SECT. VIII. Sea-ſand above Sea-mark.

But the ſituation of ſands moſt difficult to be accounted for, according to the theories at preſent moſt favourably thought of, is

[x] Thus the ſtrand at Youghall, in the county of Cork, Ireland, is no more than a common turf-bog, covered with ſand and pebbles. Hiſt. of Cork, page 109.

[y] See before, pag. 71.

that

that where ſand lies either in a *ſtratum* on the higheſt hills, or in cliffs far above full-ſea mark, with marine bodies, either mixed in and throughout, or depoſited in a diſtinct ſeparate layer. Of both theſe phænomena I ſhall deſcribe two remarkable inſtances, and then endeavour to inveſtigate the cauſe.

In St. Juſt. In a creek, called Por'nanvon, in the pariſh of St. Juſt, Penwith, near Cape Cornwall, in the Northern part of the cliff, (Plate XIX. Fig. IV.) inſerted under the clay and rubble, are ranged horizontally many rowes of large and ſmall roundiſh pebbles of the granite kind (from B. E. to C.): the covering of this pebbly *ſtratum* is fifty feet deep from A to B on the North end, but only twenty from D to E on the South, conſiſting of a rough yellow clay, charged here and there with large and ſmall ſtones, all with their angles on, but no ſolid *ſtratum* of rock above the pebbles. It is a very remarkable ſtructure which this cliff preſents us with, and highly deſerves the attention of the curious in all its parts. Firſt, the large pebbles, from one foot and a half diameter, to ſix inches, which are inſerted now in the cliff, are of the ſame ſize and texture as thoſe ſtrewed on the ſtrand below, which, being toſſed to and fro by the force of the tide, owe their roundneſs moſt probably to their circumvolutions. Secondly, I muſt obſerve, that, upon examining the interſtices of this pebbly *ſtratum*, I found many ſmall black killas and ſlatty ſtones, all with their angles ſmoothed off, and between them ſand of different kinds at different levels. That ſand which was undermoſt, conſiſted of tranſparent granules, ſpeckled with black, taſted ſalt, left a little colour of earth betwixt the fingers, but ſo little that it ſcarce coloured the water in which I waſhed it: the ſand, higher up in this *ſtratum*, was leſs pure, approaching to the colour of reddiſh clay; but higher up, the ſand was of a ſtronger yellow, equally ſalt, left ſome fine clay on the fingers, and in the microſcope had many opaque and angular little yellow maſſes among its particles, as being more affected with the clay and gravel which lay over it, than what was deeper. In ſhort, the ſand of theſe interſtices, though now fifteen feet higher at a medium than full-ſea mark, had all the evidence which could be expected, that it had come from the ſea, and was afterwards covered by a load of rubbiſh, from twenty to fifty feet deep.

In St. Agnes. Again: One of the higheſt hills adjoining to the ſea ſhore, which we have in Cornwall, is St. Agnes Beacon, on the ſide of which mountain, computed at leaſt 480 feet above the level of the ſea, the *ſtrata*, upon digging, appear in the following order: The vegetable ſoil and common rubble under it, five feet deep; a fine

ſort

ſort of white and yellow clay, of the better ſort of which tobacco pipes have formerly been made, ſix feet; under this, a layer of ſand of the ſame nature as that of the ſea below, ſix feet; beneath which is a layer of rounded ſmooth ſtones, ſuch as the beach of the ſea affords. Under this, four feet deep of a white ſtony rubble and earth, and then the firm rock, in which tin lodes ſhape their courſe. In both theſe inſtances the ſea ſand is lodged far above the level of the preſent ſea. In Por'nanvon cliff it is at a medium 15 feet higher than full-ſea mark: five and twenty Miles off, on the grounds of St. Agnes, near the Beacon, it is near 500 feet above the Sea. Other inſtances of the ſame unnatural ſituation of marine bodies, (which I here purpoſely omit) are to be found in other countries, as in Holland, Italy, and elſewhere, which have made all the chief Naturaliſts [z] agree, that at one time or other, ſome of the higheſt mountains, as well as champaign lands, have been parts of the bottom of the ſea, though now ſo much higher [a]. And indeed let us re-conſider and turn theſe circumſtances into every poſſible light, and it muſt at laſt be confeſſed, that the bed of the ſea has been undoubtedly moved upwards more in ſome than in other places, (of which I take theſe two before-mentioned inſtances to be irrefragable proofs) and it may be added, not only in Cornwall, but throughout the univerſe. But how, and when this happened, how theſe ſands became promoted to their preſent ſtation, is not eaſily decided. That fiſh of all ſorts, ſhould raiſe themſelves to the tops of mountains with the waters of the deluge is not ſo wonderful; that they ſhould be intangled, ſuffocated, and deſerted there, as the waters retired, and precipitated by deſcending torrents into bodies of diſſolved earths and ſtones, is alſo eaſy to conceive, but here the bottom of the ſea has been raiſed, fixed, and become dry land. No earthquake could be the cauſe of this, for the convulſions of an earthquake would not leave the pebbles and ſands ſo horizontally placed, as in Por'nanvon cliff, nor the clays, ſands, and ſhingle, ſo orderly and ſpecifically ranged, and the ſolid rock ſo firm and unſhaken underneath, as in St. Agnes hills. The cauſe of this elevation was therefore equal to the force of earthquakes, but gentle and equable, acting under certain laws and reſtrictions, in order to accompliſh ſome great event; an event requiring and worthy of ſuch aſtoniſhing alterations. This great event could be no other than the univerſal deluge; I do not produce theſe phænomena, the tranſlation of ſands, as direct natural proofs of the deluge, (that reſts ſufficiently firm upon revelation, as well as the *exuviæ* of marine animals every where diſperſed on dry land,) but as plain intimations of the manner in which

[z] See Varenius's Geog. lib. i. prop. 7. and Rohalt ii. Vol. p. 159. Steno's Prodromus, &c.

[a] Ray's Phyſico-theological Diſcourſes, pa. 130, 148, 214, 215, &c. third edition.

the ſea now proſtrate at the foot of cliffs and mountains, was raiſed and enabled to overflow the higheſt hills and afterwards gradually laid down to reſt in it's uſual bed. This is a part of natural hiſtory too extenſive to be thoroughly diſcuſſed here, let it ſuffice to hint, what may one time or other, perhaps, be proved to the ſatisfaction of the curious; I advance it only as a conjecture at preſent, that it being determined to extirpatethe human race, except one family, by overflowing the earth with water, the ſea was the appointed inſtrument of deſtruction; that in order to raiſe the Sea to a ſufficient height, the bottom, the bed, the chanels of the ſea, were to be lifted up, and the wrinkles of the earth ſmoothed; that when the divine decree was accompliſhed, the ſame, firſt, almighty cauſe, which conducted the waters to their neceſſary height, withdrew that power which occaſioned the elevation, and the chanels of the ſea retreated again to their wonted level:----But this return was not uniform, exact, and univerſal in all parts of the world, but general, and ſufficient to all the purpoſes of animal and vegetable life; conſequently, far the greateſt part of the up-lifted bottom, returned to the place from whence it came; part reſted in it's moſt elevated ſtation, hence the ſands, pebbles, and ſhells, on the higheſt hills; part ſunk ſomewhat, tho' ſome hundred yards ſhort of it's former depreſſion, as was the caſe at St. Agnes hill, and part ſunk till it came within a few feet of the common level of the ſea, whence the pebbles, ſands, and ſhingle of Por'nanvon cliffs, and places which exhibit the like remarkable phænomena, are found ſo near full-ſea mark.

This method of raiſing the ſea waters, ſo as to deluge the earth, will appear at firſt ſight, I imagine, too operoſe and unnatural to be choſen by an all-wiſe agent; it may be ſo; but let us enlarge our conceptions, let it be conſidered, that the higheſt mountians are no greater prominencies from the ſurface of our globe, than the duſt upon a globe of one foot diameter; that the ſea is no deeper than the furrows, nor the mountains higher above the earth, than the ridges in a ſheet of paper. Suppoſing then theſe furrows to contain a ſufficiency of water, and a determined reſolution to make that water overwhelm the ridges of this paper for awhile; would it not preſently occur, and ſeem the eaſieſt and moſt eligible method to raiſe theſe furrows ſo as that the moiſture contained might overflow ſuch ridges, and afterwards, by letting them drop again, to reſtore both the ridges and furrows to their firſt intended ſituation? The diligent enquirer (beſides the feaſibility of this method, and the egregious abſurdities of an *abyſs*, *apertures*, *diſruptions of the ſhell*, and the like, which are the inſuperable difficulties of all other ſchemes for ſupplying water ſufficient to deluge the whole earth) will recollect a great variety of phænomena in the preſent ſtructure of the earth,

which

which will ſerve to elucidate and eſtabliſh this hypotheſis. ------ So far for accounting for the different levels in which we find ſea ſand.

SECT. IV.

Origin of Mountains.

Since I have juſt now mentioned thoſe inequalities in the ſurface of the earth, called Mountains, and made little account of their height, it may not be amiſs to ſay ſomething of their origin, height, and the proportion that height bears to the diameter of the globe. This digreſſion may be perhaps the more excuſable, becauſe ſome whimſical theoriſts have repreſented Mountains as of hideous height, deforming the earth, unfit to proceed from the hand of God, and only the wrecks and ruins of the antediluvian world. I ſhall not here detain the reader with the various opinions of the learned on this ſubject, perſuading myſelf, that the moſt ſimple and brief account will beſt ſuit this work, and appear to the candid moſt agreeable to the ordinary operations of nature.

Mountains may be divided (as ſands have been before) into natural and factitious, or into primæval, and thoſe of a later date. The factitious are either the ſudden effects of earthquakes, or the more gradual productions of vulcanoes, which throw up ſuch quantities of ſtone, earth, and aſhes, as raiſe firſt heaps, then hills, then mountains: Theſe are not what I would treat of here: the queſtion is, how ſuch vaſt bodies as the Alps, the Appennines, the Andes, and other lofty mountains were generated, and came to exceed ſo much in height the adjacent lands.

The conſtituent parts of the globe at firſt in a mix'd ſtate.

Let it be granted, that the materials, or elements of which our globe conſiſts, were, at firſt, in a mixed indiſtinct ſtate; that the principles of ſolid and fluid bodies exiſted at the ſame time, but diſperſed; that the ſtony particles were intermixed with earth, both diſſevered by water, that the fire and air alſo were included in the general maſs. This was the firſt ſtate of our globe, the chaos of the more learned part of the heathen world, confirmed by the Moſaical account of the creation [a], and agreeable to the appearances of natural bodies, where we find earth incloſed in ſtone, one ſort of ſtone in another, the ſtrata divided by fiſſures, ſome lighter ſtrata underneath, and ſome heavier above; theſe were the little diſorderly miſplacings which could not but enſue from a maſs including the unconnected parts of ſuch a variety of bodies. When things were to be reduced into order, the ſolids were preadapted by the divine power to form the foundation, or the ſtiffnings (if I may ſo ſay) of the globe; ſtones fixed themſelves, by their own gravitation in the loweſt parts of the

Divided and indurated

[a] Gen. i. where we find the earth gradually proceeding from a ſtate of immaturity, to a ſtate of order, habitancy, and fertility, in the ſpace of ſix days and nights.

earth,

earth, and their contractile powers preſſed forth, and threw up into their proper elevations, the elements of air, water, and earth; elements, as neceſſary to the ſurface, as the ſtony ſtrata were to the inferiour parts of the globe. Such was the general diviſion, but it is not to be imagined that in works of ſuch immenſity, a minute exactneſs could take place: No---there was more of ſtony matter in one place, more of earth in another; in ſome places ſtones became leſs porous, and contracted into a narrower ſpace, in others more lax and diffuſed; ſome waters, ſome air, ſome fire detained at firſt in the interſtices, and afterwards eſcaping, occaſioned depreſſions, and extenſive caverns; and the matter of fact confirms this theory, for the more we examine the ſtructure of our globe, and weigh the phænomena, and conſequences of earthquakes and vulcanoes, the more cavernous we find the earth, and of the more unequal denſity. In ſhort, it was impoſſible in the nature of things, that ſuch a multifarious body as our globe ſhould ſettle and indurate with an abſolute exactneſs, or that every part of it's ſurface ſhould be accurately equidiſtant from the center. It is eaſy to obſerve, that ſome countries abound more than others in rocks already formed, and others in waters lapidific, and ready to penetrate bodies immerſed, and make their ſubſtance become ſtony [b]. Is it then any great wonder, that at the firſt induration, there ſhould be more of theſe ſtony principles, and conſequently ſtony productions, in one part of the globe than in another; in other words, that the ſhell of the earth ſhould be more or leſs denſe in ſome particular places than in the reſt? Now, wherever this greater quantity of ſtony principles was, and rocks ſettled upon rocks, and ſtood firm, there the higher grounds, craggs, hills, and mountains became protuberant, and above the common ſurface. If this ſtony proceſs was in a ridge-like form, then it produced a chain of mountains; if conical, a ſharp ſingle mountain, or more in number according to the number of cones; where a quantity of air, fire, or water was incloſed at the time of induration, in proportion to the caverns which ſuch extraneous elements occupied, ſo would be the ſubſidencies betwixt the firmer and more ſtable eminences. If thoſe caverns were deep and great, precipices would be formed in the ſides of mountains, and in cliffs; if ſhallow and oblate, gentle declivities; if theſe declivities were greatly extended, then they ſhoot forwards, and make chanels in the ſea; if damm'd up and circumſcribed, they make lakes and ſeas; all theſe inequalities are the neceſſary reſult

More hard and ſolid productions in one place than another.

Mountains and hills the neceſſary reſult of more ſolids in one part than in another, at the time of firſt general induration.

[b] Stones and rocks are no more than earth cemented by lapideous particles, educed, ſuſpended in, and collected by the common vehicle of water; theſe particles leave the fluid they are ſuſpended in, and concrete into ſtone when they meet with a proper nidus to reſt in, and attract one another with greater force, than the water divides them.

of

of the ſolids ſettling and indurating in greater quantities in one place than in another; a diſparity, not the effect of chance, nor the accidental concourſe of matter and motion, but pre-ordained by God, as productive of more benefit to mankind, by the great uſefulneſs of mountains and valleys, than if matter had been diſpoſed in a more exact and equal manner.

What will add ſtrength to this theory is, that we find the karn or ſolid rock by no means level, or equi-diſtant from the the center, but of a wavy ſurface, riſing and falling as the hills and vallies, intimating plainly, that as ſome parts of the ſurface of the globe ſettled ſtone upon ſtone, and one rocky ſtratum upon another, and thereby maintained their elevation and prominency, other parts conſiſted of a thinner ſtratum, and there depreſſions were formed, the ſurface became lower, and nearer the center of the earth.

That this ſettling of the earth into unavoidable inequalities, and thus generating mountains, may appear more natural and comprehenſible to every intelligent reader, let us conſider in the next place the height of mountains.

SECT. V.

Height of mountains to be eſtimated in proportion to the diameter of the earth.

All things are great or ſmall by compariſon, and as the mountains are but a part, and a very ſmall part too of our globe, and we are now enquiring how ſuch prominences as we call mountains ſhould ariſe, the proper way of eſtimating their height, is by comparing them with the diameter and extent of our globe, whoſe ſurface they are thought to deform, and their height and ſize reckoned utterly unaccountable.

Suppoſing then (if we make uſe of round numbers, for which we will in the ſequel make ſufficient allowances) the diameter of the earth to be 8000 miles[c], the higheſt mountain will not exceed the common ſurface but one thouſandth part, if it were allowed to be eight miles in perpendicular height from the ſea; but the Andes of America, reckoned to be the higheſt in the world, are not judged to be near four miles perpendicular, conſequently meaſured by the diameter of the earth, they are not a two thouſandth part higher than the ſea. In an artificial globe therefore of one foot diameter, the height of the mountains is too ſmall to be meaſured by ſcale and compaſs, nay it eſcapes the ſight; in a globe of eight feet diameter thoſe uneveneſſes which to the eye that ſees ſo ſmall a part of the earth at a time are ſo ſtupendous, are demonſtrably not ſo great as the twentieth part of the decimal of one foot; in other words in ſo large a globe, as that of eight feet diameter, the higheſt mountains are not prominent more than the thickneſs of half a crown Engliſh money. Again, conſider the proportion which this height

[c] Calculated to be no more than 7970.

bears to the circumference of the globe, and it will ſtill be more diminiſhed, in proportion as the ſurface of round bodies, is larger than the diameter. Conſider then, (if we may compare ſmall things to great) that if a potter were to make a globe of clay, and ſmooth it whilſt it was moiſt, with all imaginable care, then ſet it aſide to dry, is it poſſible that the ſoft ſhould become hard, that the hard ſhould become equally compact, and the texture exactly uniform, without ſuch riſings and fallings, ſuch eminencies and depreſſions, as we may now ſee on the globe? Would there be no parts which would project $\frac{1}{2000}$ part farther than the reſt? I conclude therefore, that the earth's indurating into a ſuperficies, uneven in the ſame degree as our preſent globe, was the natural reſult of a maſs of heterogeneous matter, unequally diſperſed, paſſing from a ſtate of liquidity, into a ſtate of ſolidity and hardneſs. To return,

SECT. VI. Uſes of ſands.

Sand is of various uſe, and according as it is differently conſtituted, I mean, freſh or ſalt, of a cryſtal or ſpar baſis, ſmooth, or rough and angular, tranſparent or opaque, pure or mixed, it is choſen by artiſts for caſting metals, making glaſs, cutting and poliſhing marble and free-ſtone, fixing of cement, and the like; but it is chiefly uſeful in Cornwall (according to the common opinion) in matters of huſbandry, and therefore collected at a great expence from the neareſt ſea-coaſt, although indeed it is, generally ſpeaking, not the ſand, but the mixtures we find with the ſand, which fertilize the land upon which they are carried. For ſand being only a congeries of pebbles, or little grains of ſtone, can do little more than keep the ground looſe and brittle, and this will go but a little way towards giving the huſbandman a good crop; it is to the mixture of ſalt, ſlime, ſhells and coral, that we owe fertility.

Sea-ſand.

Sea-ſand has greatly the advantage of river-ſand in agriculture, and the ſalter the better, but all ſand that is waſhed by the ſea, is not equally proper for manure. In Mount's-bay, on the beach between Penzance and the Mount, we obſerve that when the North wind blows, and the water is ſmooth, we meet with a fine, light, opening ſand, good for corn and graſs; for the ſea then moving gently, and equably, whilſt the North wind blows from the ſhore, drives the lighteſt ſand foremoſt, into a truck, courſe, or chanel by itſelf, and gives leave to the more impure, and gravelly parts of thoſe ſands, to ſettle ſeparately and farther back; but when the wind blows from the South, and the ſea is turbulent, it confounds ſand and gravel together, making a mixture utterly unfit for huſbandry. In other ſituations the wind that blows off land muſt for the ſame reaſon, diſpoſe the ſea to leave behind it the beſt ſand.

Blown

Blown ſand, * which has been long expoſed to the air, is good for little, it's ſalts are ſo waſted by wind and rain, and it's lime ſo evapourated; but take the like ſized, coloured, and textured ſand, waſhed by the ſea every tide, or covered from the air, and the huſbandman is well rewarded both in corn and graſs. The ſlime mixed with ſands, if earthy, and the product of putrified leaves, wood, and animal remains, will much enrich the ſoil, but if the offcaſts of ſtamping mills, or the ſediment of mines, their acrimonious mineral juices are mortal enemies to vegetation.----When ſand is of a ſparry calcarious ſubſtance, and will ferment with acids (as the ſand of Heyl and of ſome other places will) then it acts as lime, and does of itſelf fertilize the ground in proportion to the lime which it contains. Better ſtill is that ſand which is plentifully mixed with ſhells and their fragments, for as ſhells are of the nature of lime, moulded and fixed into a ſhell by an unctuous cement, ſuch ſand, in proportion to the ſhells it contains, will give the heat of lime and the fatneſs of oil to the land it is laid upon. Of this ſand they have ſome in the iſlands of Scilly, which good huſbandmen find their account in preferring (though at a greater diſtance) to their other ſands. In Cornwall, Whitſand-bay ſand in Sennan pariſh has ſome fragments of ſhells, and ſometimes entire ſmall ſhells among it, it riſes and plays up and down in *aqua fortis*, and makes a moderate efferveſcence like ſpar, but that which has the moſt ſhells, as far as I am yet informed, is that of Porcurnow Cove, near the Land's-End, which plays briſkly, makes a conſiderable colluctation, diſſolves in *aqua fortis*, and crackles much in the fire. All theſe ſands have more ſhells at ſome times than other, according as the winds have been more or leſs favourable to the mixture.

Blown ſand.

Slimy ſand.

Sparry ſand.

Shelly ſand.

But the beſt of all our Corniſh ſands, is that which is intimately mixed with coral: In places where this excellent manure is found, it is taken up by a large bag of the ſtrongeſt canvas, to the mouth of which is fitted an iron hoop or frame for keeping it open, and ſinking it to the bottom of the ſea, ſo as it may receive the ſand and coral as it is dredged along by the bargemen. A barge-load is uſually deliverd for ten ſhillings, or leſs if nearer the place of dredging, and where the land is good a barge-load will dreſs an acre of ground; it is uſed more for corn than paſture grounds. The fertilizing quality of coral is owing to the ſame cauſe as that of ſhells, for it is of the ſame limy nature, and makes a ſtrong efferveſcence with acids, and, being more ſolid than ſhells, conveys a greater quantity of fermenting earth in equal ſpace. Beſides, it does not diſſolve in the ground as ſoon as ſhells, but decaying more gradually continues longer to impart its warmth to the juices of the

Coral ſand.

* Sand blown up from the ſea-ſhore upon the lands adjoining.

earth.

earth[d]. The calcarious particles of which this coral is compoſed, are diſperſed all over the weſtern ſhores of Cornwall, as is plain from the coralline moſs, incruſtations, eſcharæ, ſprig, and bunchy coral diſperſed on the rocks, ſands, and ore-weed of Mount's-bay, Land's End, and the North chanel, but the principal place in Cornwall where this coral is found in ſuch quantity as to be dredged for manure is in Falmouth Harbour, and the ſhores adjoining[e].

Let me add that a great deal of this calcarious coral matter ſwims unfixed and liquid in the ſea water, of which the teſtaceous animals form their ſhells, and into which the ſhells of dead animals are again reſolved, and ſupply materials for the dwellings of a freſh generation. 'Tis to this coral impregnation that we owe in a great meaſure the fertility occaſioned by the air, and froth of the ſea, or ſea-water carried upon the land with ſand or oreweed. In ſmall iſlands which are oftentimes waſhed all over by the ſpray of the ſea during a ſtorm, it is obſervable, that if ſome gentle rain immediately follows the ſtorm, ſo as to waſh in the nutritious contents of the ſea-water, before they are dried and diſperſed by the ſun and wind, their graſs and other plants thrive ſurprizingly.

CHAP. VIII.

Of Huſbandry in Cornwall; its ancient and preſent State.

THE art of Huſbandry was little practiſed in Cornwall two centuries ago[f]; "Their grounds lay all in common, or only "divided by ſtitch-meale, and their bread-corn very little; their "labour-horſes were ſhod only before[g], and the people devoting "themſelves entirely to tin, their neighbours of Devonſhire and "Somerſetſhire, hired their paſtures at a rent, and ſtored them "with the cattle they brought with them from their own homes, "and made their profit of the Corniſh, by cattle fed at their own "door; the ſame perſons alſo ſupplied them at their markets with "many hundred quarters of corn, and horſe-loads of bread." Car. p. 19, &c. This was a very diſadvantageous ſtate of the commerce of this county, for the products of the tin will always be fluctuating and precarious, but the neceſſity of fleſh and corn is perpetual, and the returns from huſbandry properly managed, annual, regular, and conſtant; people therefore increaſing, and the mines ſometimes

[d] The ſeveral ſhapes in which this coral appears, I ſhall take farther notice of hereafter, among the marine productions.

[e] Some coral is found on the coaſt of Ireland in Bantry-bay, and is counted the richeſt manure they have in thoſe parts. Natural Hiſtory of Cork. Vol. II. page 380.

[f] Not paſſed the remembrance of ſome yet living ſays Mr. Carew, page 66, who publiſhed in 1602.

[g] Ibidem, page 67.

failing,

failing, the Corniſh felt the neceſſity of applying themſelves to huſbandry, " there being no trades, (ſays the judicious Mr. Carew, " pag. 21.) which ſet ſo many hands at work, at all times of the " year, as that one of tillage". Their improvements anſwered their expectations, and in the latter end of the reign of queen Elizabeth, the Corniſh found themſelves in a capacity, not only to ſupport themſelves, but to export a great deal of corn to Spain, and other foreign parts. Cultivation has been advancing ever ſince, and better fenced, and more profitable incloſures for the plough are no where to be ſeen, than the banks of our greateſt rivers Tamar, Alan, Fal and Fawy, and the ſea-coaſt of our harbours can ſhew[h].

In the eaſtern parts of the county, they uſe lime made of a coarſe marble-ſtone, for manure, and ſome of this lime riſes in Cornwall: On the Barton of Wolvedon, in Probus pariſh, there has been lime-ſtone found; there is a lime quarry on the lands of Sir John Moleſworth, Bart. of Pencarrow. Near Padſtow, there is marble, but it has never anſwered the expence of burning for lime. At New-Kaye, in the pariſh of lower St. Columb, they find a coarſe marble on the ſhores, which they have burnt for lime, and it burns freely, but the ſtone has ſo much of the cryſtalline matter in it, that in the lime there were found many ſmall lumps of ſtone vitrefied, which greatly diminiſhed the price. This is probably what Grew * (Muſ. R. S. pag. 316) calls the worſt ſort of Corniſh marble uſed for lime. The beſt lime-ſtone I have heard of raiſed in Cornwall, is in the pariſh of South Pedherwyn, which anſwers very well, and is much uſed thereabouts: This is near the confines of Devonſhire, from which, (namely from Plymouth and Lyfton quarries) the Eaſtern parts have moſt of the lime which ſerves for manure. Lime manure.

Of marle the uſe is little known, and leſs practiſed in Cornwall; but marle we have in ſeveral places; ſo that we cannot ſo juſtly tax the land for being deſtitute of that uſeful manure, as blame the inhabitants, the greateſt part of whom having ſea-ſand and ore-weed in plenty, do not heed what their own grounds might afford them to their great emolument; others again have their attention ſo much engroſſed by tin and copper, that although they ſhould turn up marle every day, and indeed often do ſo, yet every thing gives place to the greedy queſt of metals. It muſt be allowed, that dreſſing abundantly with marle, as in ſome counties they are obliged to do, to the amount of fifteen or eighteen hundred loads in an acre, is extremely expenſive, and cannot in a few years anſwer the expence, but our Corniſh ſoil in general needs not ſo thick a coating, one hundred load may be enough in an acre; neither need we uſe any marle but what by experiment we find quickening Marle.

[h] Having compared the waſte, and the cultivated grounds of each hundred, as impartially as I could, I reckon the latter are to the former as 20 to 11.

* Compleat Body of Huſbandry.

and fertilizing, the firſt or ſecond year at fartheſt: In place of that which will not turn to account till after ſome years diſtance, we had better ſubſtitute the preſent, eaſily acquired manures of ſand, ore-weed, ſtraw, and animal *fæces*, unleſs in ſuch places where the lord of the land chuſes to form a new ſoil; there a great depth of marle is neceſſary, and the inheritance will juſtify the meaſure. Marle both ſtony and clayey, may eaſily be diſtinguiſhedfrom other foſſils, by diſſolving readily in water, and by the ſalt it contains crackling in the fire. Marle has been diſcovered and tried with ſucceſs on the lands of Sir Richard Vyvyan, Bart. near Trelowarren. There is a yellow ſandy marle, found in the ſame field with a newly diſcovered quarry of ſtone, in the lands of Mr. Scawen, about half a mile from the borough of Michel, which being laid on the graſs there, much improved the vegetation; but the marle which anſwers beſt as far as I have yet heard, is that diſcovered by a farmer of St. Allen pariſh, near Truro; it is a ſtony grit, eaſily bruiſed between the fingers, ferments not with acids, ſoon permeated by water, but gives it no taſte, is of a brown-ochre colour, and ſo full of yellow micaceous talc, that the farmer having thereby found much ſucceſs in his crops, called it his gold-duſt. Some marle of the ſame kind nearly, I have ſeen, found in the pariſh of Conſtantine; and ſome I have from the pariſh of Pheock, where it is laid by nature in great quantities, but neglected by the inhabitants. Some other ſorts of marle, of a ſtiffer clay, and whiter colour, I have received from the Rev. Mr. Buckland, Vicar of St. Allen, which he has uſed to good effect, in improving coarſe grounds. Of lime and marle therefore, we make not much uſe, but if other manures were to fail, it is not unlikely but more marle and lime-ſtone might ſoon be diſcovered.

Sea manures. Oreweed.

In Cornwall, our chief manures are from the ſea, and the ſea is very bountiful in this reſpect; not only ſea-ſand is uſed by every one who has it in his reach, but after ſtorms we find the Alga marina, Fucus, Conferva, or oreweed ſcattered in great plenty on the ſhore, and tho' the Italians neglected it[1], yet it deſerves a place among the beſt manures which nature affords us. Some diligence and caution however, muſt be uſed, for being a ſubmarine plant, the wind and ſun will ſoon exhale all it's moiſture. The ſooner therefore it is taken from the ſhore, the better, and being ſpread on old or ſtiff earth, then covered with ſand, it ſoon diſſolves into a ſalt oily ſlime, which contributes much to fatten and meliorate the other manures, and this is the moſt approved way of applying it. Some lay it naked, and

* —— Alga littus inutili
Demiſſa tempus ab Euro
Sternet. Hor. Od. lib. 3.

— — Projectâ vilior Algâ. Virg. Eclog. 7.

† See chap. preceding.

freſh

To S.r Richard Vyvyan Bar.t this South Cornwall, engravd at his expence

View of Trelowarren in the Parish of Mawgon, is most gratefully inscribd by

Wm Borlase.

freſh from the ſea, upon their barley lands, in the end of March and beginning of April, and have a good crop of corn; but the weeds grow ſo plentifully and rank afterwards, that no wholſome graſs for paſture, is to be expected for that year. It is reckoned to give a diſagreeable moiſture to aſparagus, potatoes, and other roots, and it is obſerved by Sir George Mackenſie, [k] that lands often uſed to this manure, yield bad oats, and in a ſmall quantity, the huſks thicker than ordinary, and more darnel among the corn, than in lands which have not ſo much oreweed laid on them.

Other manures ariſing from putrefaction, burning the ſtroil, and the *fæces* of animals are as common in this county as elſewhere, and differ not in their management; but near fiſhing towns, the huſbandman in Cornwall has the advantage of purchaſing, for a ſmall matter, bruiſed, decayed pilchards, not fit for market, and alſo caſt ſalt, that is, bay-ſalt which has been uſed already for ſalting pilchards, and being adjudged by the officer of the cuſtoms no longer fit for that uſe, is ſold to the huſbandman from four-pence to ſix-pence a wincheſter: Theſe offcaſts of the pilchard cellars, conſiſting entirely of ſalt, oil, and putrefied fiſh, and eaſily carried, becauſe little of it ſuffices, may therefore be reckoned the cheapeſt, as well as richeſt manure any where to be procured. It will warm the coldeſt land, throws forth plenty of natural wholeſome graſs, as well as corn, and by the verdure it ſupports, demonſtrates it's laſting enlivening virtue even ſome years after it has been laid on. However, being extremely hot, experience ſoon convinces us, that it is beſt when left to diſſolve, temper, and digeſt it's ſalts in heaps of earth and ſand, before it be carried forth upon the arable ground. Fiſh manure.

The ſeeds we ſow are wheat, barley, oats, and rye, beſides which, we have the *Avena nuda* of Ray, called in Cornwall pilez, which grows in the pooreſt croft-land that has been tilled two or three ſeaſons before with potatoes, and for the uſes of the poor anſwers all the purpoſes of oatmeal: It is a ſmall yellow grain of the price of wheat (reckoned of the wheat kind) and for fattening calves, accounted ſuperiour to any other nouriſhment. Rye is much leſs tilled of late years, ſince barren lands have been ſo improved as to bear barley; but of barley we make double uſe, and therefore have a double demand for it, I mean for bread, as well as beer. In Mullion, and ſome pariſhes near the Lizherd, they have ſown barley, and in nine weeks commonly, oftentimes ſooner, they have had it again in the ſack, fit for market. This quick return is not owing to any one particular ſort of barley, [l] but to the ſoil and ſituation, and a kindly warm ſeaſon, the nights in the ſummer Seeds.

[k] Philoſ. Tranſ. No. 117, pag. 390.

[l] As Dr. Plot ſeems to think. Oxfordſh. pag. 55.

time

time on the ſea-coaſts being ſeldom or ever cold [m]. The greateſt crop of this grain which has reached my notice, is that of a field near Philac church, in which, as the Rev. Mr. Glover, Rector of that pariſh, aſſured me, he had, in the year 1752, thirty buſhels of barley, each buſhel containing three wincheſters, on one ſtatute-acre of land.

As to wheat, ſome of our lands are alſo very fruitful, the moſt remarkable inſtance I know, is that of Thomas Roberts, Tanner, of the town of Penzance, who, in the year 1740, had twenty buſhels of wheat, (each buſhel three wincheſters, or twenty-four gallons) on one ſtatutable acre of ground, adjoining to the town; and he had not only plenty, but was equally fortunate in the price, for he ſold each buſhel for one guinea, ſo that deducting one guinea, which he paid for the tythe, he made nineteen pounds nineteen ſhillings clear, of the grain produced by one acre of ground. In Cornwall it is the cuſtom to bind into ſheaves the barley and all other grain, as well as the wheat, and for their better ſecurity afterwards, we make all our corn into arriſh-mows, the ſheaves being built up into a regular, ſolid cone, about twelve feet high, the beards all turned inwards, and the butt end of the ſheaf only expoſed to the weather; the whole cone is finiſhed by an inverted ſheaf of reed, or corn, and tied to the upper rows: This cuſtom may be partly owing to the greater inconſtancy and moiſture of our weather in Cornwall than elſewhere, and to the uſe of coarſer grains in bread, (which therefore require the more ſecurity) but whatever the cauſe is, the conſequence juſtifies the precaution, and the grain is thereby much better preſerved: By this means indeed our fields, in time of harveſt, make a very ſingular appearance in the eyes of ſtrangers, as may be ſeen at F. f. in the proſpect of Enys, the ſeat of John Enys, Eſq; PL. VII. which was drawn in the time of harveſt; but in inclement harveſts our corn muſt be guarded from rain and wind better than by the manner of ſaving the grain in the neighbouring counties [n]. Our market-meaſure of thoſe ſeeds is irregular, our common buſhel is reckoned to conſiſt of three wincheſters, or twenty four-gallons. In the larger farms we generally plough with two or more oxen, and two horſes before them, which make but a ſlow progreſs, eſpecially as our ploughs are dragged through the ground. It is the general cuſtom, at the laſt tillage of the ground, to ſow twelve gallons of Ever-graſs [o], with ten pounds of clover [p], or

[m] For the ſame reaſon, namely, the uninterrupted progreſs of vegetation by night as well as day, corn, in Lapland, ripens ſooner than in France. Linnæus Tranſ. of the Acad. Sued. vol. i. pag. 22. Pontopid. pag. 101.

[n] I am informed they have the ſame cuſtom in ſome of the inland parts of Germany, where the apprehenſion of rains need not be ſo great as in Cornwall.

[o] Gramen Loliaceum; ſive Lolium Rubrum. Ray. 2d. Edit. pag. 249.

[p] Trifolium purpureum majus; or ſativum of Plot, Oxford. pag, 156.

the

To John Enys Esqr. This View of Enys house in the parish of Gluvias, Cornwall, engravd at his expence is most gratefully inscribd by

Wm Borlase.

the melilot trefoil [q] in each acre. Theſe trefoils thicken the ever-graſs, and both together conſiderably add to the paſture, eſpecially in poor lands and narrow limits, in the former of which the huſbandman cannot expect natural-graſs under two or three years, and in the latter he cannot ſtay a year for the natural-graſs to come without diſtreſſing his cattle. Saintfoin, or everlaſting-graſs has of late been introduced, and in dry, coarſe, ſhallow grounds, it is thought may promote paſture. Of late, the turnip huſbandry has begun to obtain, and ſeveral gentlemen have experienced the benefit of this uſeful root, in feeding ſheep and other cattle, and mellowing the land for corn. The potatoe is ſtill a more uſeful root, now every where cultivated, and in ſhallow, poor lands, ſeaſonably tilled thrives beſt; grateful to the rich, the ſupport of the poor, and moſt ſalutary to both. There are two ſorts; the flat, or kidney potatoe, which may be planted early in the winter, and will be fit to draw about the midſummer following, and laſts in perfection till Chriſtmas. The other which is a round potatoe, and ought to be planted in the ſpring months of April or May, will be fit to draw at Chriſtmas, and will laſt in perfection till the Autumn after. Of this latter ſort (which grow very large in an airy, ſunny ſpot) I had one brought me in January 1756, which was thirteen inches and $\frac{8}{10}$ in girt, and ſeven inches long, and weighed when taken out of the ground, thirty-two ounces; after it had been drawn ſome days, I found it to weigh twenty-nine ounces and a half; I placed it in a ſunny corner, and found that it produced potatoes, great and ſmall, to the number of twenty-one.

Mr. Camden [r] tells us, that "all manner of grain, in his time, "was produced in ſuch plenty in Cornwall, that it did not only "ſupply the neceſſary uſes of the inhabitants, but Spain alſo, "with vaſt quantities of corn;" but we muſt now make a different eſtimate. The inhabitants ſince Camden's time are more advanced in number than the tillage has encreaſed in proportion, and though the low lands in Cornwall, eſpecially along the Tâmar and Alan may yield more corn than the inhabitants of thoſe parts, and the leſs fruitful hundreds of Stratton and Lyſnewyth can diſpenſe with, yet the hundreds of Poudre, Kerrier, and Penwith, and the weſtern parts of Pydre (far the moſt populous tracts of our county) do not yield corn near ſufficient to ſupply the inhabitants. Upon the whole, if thoſe parts entirely addicted to huſbandry, will yield a ſufficiency of grain to make up, in a moderate year, what is wanting in the parts leſs cultivated, and more addicted to mining, this is full as

[q] Trifolium agrarium Dodonæi. [r] Engl. pag. vi.

much as can be aſſerted in this particular. In a plentiful year we may ſpare a little quantity for exportation, in a moderate year have enough for ourſelves, in a year of ſcarcity not near a competency. As the ballance is ſo even, it is the intereſt of the Corniſh by no means to ſlacken or reduce the preſent ſtate of huſbandry, by withdrawing too great a number of hands from it, for working their mines. Huſbandry, it muſt be remembred, can employ and ſubſiſt a people without mining, but mining can do neither without huſbandry. If mining, tempting as it is with the hopes of ſudden and immenſe gain, exceeds much its preſent limits, agriculture muſt decay; it is beſt therefore to encourage both, ſo as that the former may promote the plenty of money, the latter of food and rayment, and both the happineſs of that ſpot where they meet aud reciprocally relieve, as they do at preſent the deficiencies of each other. It is a facetious, but no uninſtructive ſtory which Plutarch *(de Virtute Mulierum)* gives us on this occaſion[s]. "Pythis a king, having "diſcovered rich mines in his kingdom, employed all his people "in digging them, whence tilling was wholly neglected, inſomuch "that a great famine enſued. His queen, ſenſible of the calamities "of the country, invited the king her huſband to dinner, as he "came home hungry from overſeeing his workmen in the mines: "She ſo contrived it that the bread and meat were moſt artificially "made of gold, and the king was much delighted with the con-"ceit, till at laſt he called for real meat to ſatisfy his hunger. "Nay, ſaid the queen, if you employ all your ſubjects in your "mines, you muſt expect to feed upon gold, for nothing elſe can "your kingdom afford you."

CHAP. IX.

Of the Stones in Cornwall.

IN Cornwall, where there are not only Quarries of ſtone as in other parts for building, but a great number of mines, a variety of ſtones muſt needs offer itſelf to our examination. They may be all ranged under the following general heads. Firſt, ſtones of uſe. Secondly, ſtones of ornament and curioſity. And thirdly, ſtones of profit[t].

SECT. I. Quartz.

Stones of uſe are either of inferiour, or important and neceſſary uſe. Among theſe of ſeemingly ſmall importance, I muſt reckon what

[s] Thus engliſhed in Fuller's Holy State. p. 107.

[t] We ſhall obſerve as we go along the *claſſes*, *orders*, *genuſſes*, and *ſpecies* of the chief ſtones, as ranged by the ſyſtematical writers, though we cannot entirely purſue their method, in a particular natural hiſtory of a county.

the

WB. delin.

IG. sculp.

To Mrs Jane Hoblyn this South View of N. ANSWHYDN House in the parish of St Columb, Cornwall, engravd at her expence is most gratefully inscribd.

by Wm: Borlase.

the ſurface of the land in moſt parts of Corwall, yields in great plenty, I mean an opaque whitiſh debaſed cryſtal, commonly (but indeed erroneouſly) called white ſpar; theſe ſtones are extremely hard, and repair roads, and face our hedges; being full of angles they make the beſt pitch-work for paving courts, ſtables, and the like; the pavement not eaſily growing ſlippery, or breaking, where theſe ſtones are well laid [u]. This ſtone by the Germans is called Quartz, and becauſe we want a name for it in Engliſh, it will be ſo called for the future. It is vitreſcent, ſtrikes fire with ſteel, not ſoluble with *aqua fortis* [w], and is the general *baſis* of moſt of our Corniſh ſtones.

SECT. II. Cockle.

In moſt of our compound ſtones in Cornwall, there is more or leſs of a black ſtony matter which we call Cockle. Sometimes it is intermixed as ſpots and veins, and ſometimes it is the *baſis*. Broken tranſverſely it is of a dull earthy black, ſcarce ſo bright as the duſt of pitcoal; it's texture conſiſts of fibres parallel, and gloſſy, theſe fibres make either *laminæ*, *ſtriæ*, or granules [x]. It ſhews itſelf every where fibrous, and when it is in its pureſt ſtate, and has neither metal, nor ſtone different from itſelf (as we often find it in the pariſh of St. Juſt) it ſhoots into granules of irregular planes, inclinable to a priſmatick figure, not in the leaſt flexible, but ſhining and reſembling in ſhape, the granulated cryſtals of tin-ore, and when free of earthy impurities, ponderous and ſo near to the ſpecific weight of that metal, that nothing but tryal by water or fire can diſtinguiſh the cockle from tin. It is nothing worth of itſelf, but 'tis either the *baſis*, or makes a conſiderable part of our moſt uſeful, and remarkable ſtones. It weighs to water as $3--\frac{8}{99}$ is to 1 [y].

SECT III. Elvan.

Another common ſtone with us in Cornwall is the Elvan [z], of very cloſe grit; and ſo extremely hard that it will not cleave, nor break to face or joint, and if tin-ore happens to be included in this ſtone (of which there are ſeveral inſtances in Senan pariſh and elſewhere) 'tis not worth the pains of getting at, unleſs it be in greater quantities than what we generally find in ſuch hard ſtones; if uſed in building it generally goes into the wall in the ſame ſhape that

[u] Two parcels in caſks have been lately ſent from Truro to London at the deſire of ſome perſons principally concerned in the porcelain manufacture, for which their colour and hardneſs ſeem to render them a neceſſary ingredient, as well as for making of glaſs, and fuſing of copper. Linnæus, Syſtem. Nat. page 153.

[w] Of the ſecond *genus* of Linnæus, Syſt. Nat. page 153, it is the ſecond *ſpecies*.

[x] Of both the former I have ſome inſtances from Caſtle Treryn in St. Levin.

[y] Dr. Woodward, Cat. Vol. ii. page 23, calls it "a black thready mineral, ſeeming to be a "fibrous talc." Hill, page 499, calls it "a fo-"liaceous, black, cryſtalline talc." Linnæus ſeems to have the ſame body in his view among his *micæ*, in the fourth *ſpecies* of his apyrites, *genus* 7, page 159. See alſo his ſecond *ſpecies* of talc, pag. ſequ.

[z] Quaſi ab Hêl-vaen, i. e. the ſtone generally found in brooks; unleſs it be a corruption of Anvon, which in Corniſh ſignifies a ſmith's anvil, and might fitly repreſent this very hard ſtone.

nature

nature left it in; it is not found in ſtrata or quarries but in detached angular maſſes, ſometimes in large rocks, and is uſually of a grey blueiſh colour. If the nodules of this ſtone are found of a portable ſize and a plane ſurface, ſo as to need little poliſhing, they make ſtones for grinding the moſt precious colours, far beyond any marble and equal to any porphyry.

There is another ſort of Elvan, which conſiſts of a yellow clay cement, thick ſet with opaque, white and yellow cryſtalline granules, and theſe thinly beſprinkled with cinereous grains; both the grains and granules have ſmooth and plane ſurfaces: This ſtone riſes in a quarry at Boreppa in Camborn, and elſewhere, is found in large nodules, immerſed five feet deep and more in the Vorlas clay-pits in Ludgvan, and in ſmoothed nodules on the beach betwixt Penzance and Marazion; it is not near ſo hard as the former.

SECT. IV. Killas.

More common ſtill, of more various appearance and neceſſary uſe, is the ſtone which we call Killas [a]. It is of the ſchiſtos kind, ſome ſorts more friable, and ſome more laminated than the reſt; there is ſcarce any field or common, where in ſome ſhape or other we do not find theſe ſtones, but where there are any quarries of it, the top of the ſtratum is covered with looſe, thin ſtones, interſperſed with earth and clay, and a few feet below, lies the ſolid ſtone, the crevices of which are nearly perpendicular and horizontal; theſe ſtones generally dip towards the Weſt, and riſe flat, of a very even thickneſs, for which reaſon I imagine they are called by the Tinners, Raze [b]; they have a ſmooth face for building, and make a ſtrong wall, but are apt to be feather-edged, which makes them lodge water, and throw damps into the walls. There are three ſorts of this ſtone, the yellow, the cinereous or blueiſh, and the brown. The yellow is hard and laſting, if laid in nearly the ſame figure as it riſes, but breaks eaſily into ſhivers, and acroſs the grain, ſo that it will not bear hammering; it does not ferment with *aqua fortis*, nor give fire with ſteel, of a ſandy grit and uniform texture, with a yellow ochreous clay in it's commiſſures, and weighs to water as $2\frac{94}{124}$ is to one.

The blueiſh killas is ſometimes ſo exceeding hard and ſtubborn, that in the mine they give five pounds a fathom [c] for breaking it; at other times it is as eaſy to break as pitcoal. Round the town of Marazion, and other places, (but better ſtill in a large and ancient quarry at Helſton in Kerrier,) there riſes a very tender killas, of the cinereous, and alſo of the yellow colour, both ſprigged with ſpecks of a darker hue, the texture of both the ſame,

[a] Dr. Woodward Cat. V. ii. pag. 6. ſays we call any ſtone killas that ſplits with a grain.

[b] Woodward's Cat. vol. i. pag. 202. m. 9.

[c] Six feet long, ſix high, and three wide.

viz.

To Francis Buller Esq^r this view of Cornwall, engrav'd at his expence, is most gratefully inscrib'd by

Anthony house in the parish of East Anthony,

Wm. Borlase.

viz. a very ſmall proportion of ſtony cement added to a fine ſand and earth. This ſtone is conſequently of a ſmall grit, is very eaſy to ſquare, and makes very dry walls and cloſe joints, but ſeldom riſes larger than from a foot high to two feet long, and is apt to ſcale off at the corners. Of this kind, but of a more compact, uniform, and finer grit, we find in ſome places very good whet-ſtones for edging knives and other tools: the rock, called Karn-Jenny, near Penzance pier, produces a courſe of theſe almoſt as fair and good as the hones of the ſhop, and are uſed as ſuch in that neighbourhood. A ſpecimen of this kind weighs to water as $2--\frac{88}{97}$ to 1.

Some of the cinereous killas conſiſt of thin *laminæ* laid in ſtreight lines one over another in like manner as ſlat, to which it approaches very near, but never riſes wide and thin enough to anſwer the uſes of it. Its maſſes however are larger than thoſe of the Helſton quarry, but more ſpungy, ſubject to ſoft places, and more apt to decay and give way to the weather. Of this ſtone is built the houſe at Nanſwhydn, Plate VIII.

In many places the quarry-ſtone of the brown ferruginous killas riſes large and hard, and with this they build in the Weſtern parts of Cornwall, and in the Eaſt at Camelford, Lanceſton, and elſe-where; but it is ſubject to the ſame inconveniency of damps as the yellow before-mentioned. In ſome places it riſes in ſuch large flakes, ſo eaſy for working, and they may be laid on their edge ſo cloſe, that they prove excellent materials for building piers and moles into the ſea; the beſt I have yet heard of, is that which riſes on the parſonage grounds of Mawnan, from which a great deal is carried off yearly for building and repairing the Kayes at Falmouth, St. Maws, and other trading towns in that harbour.

SECT. V. Slat.

On the South coaſt, betwixt Liſkerd and the Tâmar, there are ſome quarries of ſlat, which is brought down and ſhipped off at Tidiford and Morlham, and, by means of the Tâmar, ſupplies the neighbourhood of Plymouth with covering for their houſes, and is thence exported in pretty large quantities: there are alſo ſome quarries of ſlat at Padſtow on the North coaſt, whence, for many miles to the Eaſt, the whole country is ſubject to a ſhelfy ſlat. There is a better quarry ſtill at Tindagel; but the beſt covering ſlat which we have in Cornwall, and indeed in all England, "[d] perhaps the "fineſt in the world," is at Denyball, about two miles South of Tindagel, which will therefore require our more particular notice. The whole quarry is about 300 yards long and 100 wide: the

Dennyball quarry.

[d] Dr. Woodward, Cat. vol. II. page 5.

deepeſt part from the graſs, is judged to be forty fathoms: the *ſtrata* in the following order: the green ſod, one foot; a yellow-brown clay, two feet; then the rock, dipping inwards into the hill towards the South-Weſt, and preſerving that inclination from top to bottom: at firſt the rock is in a lax ſhattery ſtate, with ſhort and frequent fiſſures, the *laminæ* of unequal thickneſs, and not horizontal: thus the rock continues to the depth of ten or twelve fathom, all which is good for nothing, and entirely to be rid off; then comes in a firmer brown ſtone, which becomes ſtill browner in the air: this is fit for ſlatting houſes, and the largeſt ſize for flat pavement, never ſweating as the cliff ſlat which is expoſed to the ſea-air. This is called the *top-ſtone*, and continues for ten fathom deep, the ſtone improving ſomewhat as you ſink, but not at the beſt till you come to twenty-four fathom deep from the graſs; then riſes what they call the *bottom-ſtone*, of a grey blue colour, and ſuch a cloſe texture, that on the touch it will ſound clear, like a piece of metal [c]; the maſſes are firſt raiſed rough from the rock by wedges driven by ſledges of iron, and contain from five to ten, twelve, or fourteen feet, ſuperficial ſquare of ſtone: as ſoon as this maſs is freed by one man, another ſtone-cutter, with a ſtrong wide chizel and mallet, is ready to cleave it to its proper thinneſs, which is uſually about the eighth of an inch; the ſhivers irregular from two feet long, and one foot wide, downwards, to one foot ſquare, and ſometimes (though ſeldom) dividing into ſuch large flakes as to make tables and tomb-ſtones.

In this quarry ſeveral parties of men work on ſeparate ſtages or floors, ſome twelve fathom from the graſs, ſome twenty, others forty fathom deep, according to the portion of ground belonging to each party; the ſmall ſhattery ſtone, not fit for covering houſes, ſerves to ſhore up the rubbiſh, to divide the different allotments, and ſhape the narrow paths up and down the quarry; all the ſlat is carried with no ſmall danger from the plot where it riſes, on men's backs, which are guarded from the weight by a kind of leather-apron, or rather cuſhion; the carrier diſpoſes his charge of ſtones in rows ſide by ſide, till the area allotted to his partners is full, and then horſes are ready to take them off, and carry them by tale to the perſon that buys them. The principal horizontal fiſſures, which divide the *ſtrata*, run from ten to fifteen feet aſunder; they are no more than chinks or joints, and contain no heterogeneous foſſil. The ſtone of this quarry weighs to water as $2 - \frac{62}{121}$ are to 1, is not ſubject to rot or decay, to imbibe water, or ſplit with falling, as the *bottom-ſtone* of Tindagel, and other quarries; but for its lightneſs, and enduring weather, is generally preferred to any ſlat in Great-Britain.

If

[c] Schiſtus fiſſilis, durus, cœruleſcens clangoſus. Linn. Syſt. Nat. page 158, N°. I.

To Francis Basset Esqr this Eastern view of Tehidy in the parish of Illogan, Cornwall,
engravid at his expence is most gratefully inscribd by *Wm Borlase.*

If this quarry was ſituated nearer to a good harbour, much greater advantage might be made of it; but all the ſtone exported, muſt be carried by land to a little cove, called Portiſſik, four miles off, on the North coaſt, where no ſhips of burthen can ſafely take in their loading; and what is not exported, is diſperſed in the neighbourhood by an expenſive land-carriage. In ſome places[f] we have a very red ſlat in ſmall ſhivers, the only uſe of which, as far as I have learnt, is, that it ſerves the maſon and carpenter to line and mark out their work.

SECT. VI. Corniſh free-ſtone.

In the next place let us take a view of thoſe ſtones which conſiſt of a larger grit, and a more compounded nature, than what are gone before. And, firſt, of the free-ſtone, or *lapis arenaceus*: This is of two ſorts; the free-ſtone conſiſting of ſand and ſpar, and that which conſiſts of a ſand and quartz. The pureſt free-ſtone (I mean, that neareſt to the natures of Portland, Oxford, and Bath-ſtone) that I have ſeen raiſed in Cornwall, and indeed the only one that may be ſtrictly ſo called, as far as I yet know, is found in the pariſhes of Carantoc and Lower St. Columb, in the latter of which pariſhes it makes a *ſtratum*, about twelve feet thick, at New-Kaye, where this ſtone may be had in great quantities, and of almoſt any dimenſions, nearly level with the ſurface of the ground, and contiguous to the ſea. Its grit is of a ſmall yellowiſh ſand, cemented together by ſpar. That which has been expoſed to the air for any time is very hard, as we may ſee in the old church and tower of Carantoc, which are built in great part of this ſtone: it wholly diſſolves in *aqua fortis*; it weighs to water as $2--\frac{101}{132}$ to 1. It imbibes water plentifully, and retains it too; and conſequently would imbibe the moiſt cement, and make a compact cloſe wall, dry as brick. If a quarry of this ſtone were properly opened, no gentleman in Cornwall needed to ſend to Portland; for, without queſtion, this ſtone, though not altogether ſo fine, would ſerve all the purpoſes of that; and it is ſomewhat ſurpriſing, that ſuch a treaſure as this ſtone might prove with management, ſhould lie bare to the eye, and ſo convenient for water-carriage, and yet hitherto neglected. This is the only perfect free-ſtone which I have ſeen in Cornwall; but in ſeveral places on the North coaſt, we find a ſtone of the ſame ſtructure and materials, though incompleat, and in a ſtate of immaturity, as I imagine, having never arrived to a hardneſs ſufficient for uſe. Theſe imperfect ſtones which are ſpread here and there among the Gwythian and Piran ſands, are the accidental formations of a thinly diſperſed ſparry or *corallin* juice, blown up, together with the ſpray of the ſea, in

[f] In the pariſh of Conſtantine, and elſewhere.

quantity

quantity ſufficient to connect the ſand together, but not enough to concrete into a firm hard body. Dr. Woodward's Cat. vol. II. p. 3, ſays the inhabitants call it a kerned ſtone; that is, a coagulated ſtone, but juſt congealed; and indeed it is no more than the blown ſand incruſted into ſtone in ſo many thin ſeparate layers, one over another, as the ſand was thrown in, mixed with the ſparry ſpray, at ſeveral ſucceſſive times, by the Northerly winds. Let no one wonder that the ſpray of the ſea ſhall produce ſuch an effect; for that ſpar is ſuſpended in all water is likely; but, in particular waters, is evident from incruſtations formed in the bottom of culinary veſſels, and in water-pipes, from petrified moſs, and many other phœnomena; and that ſpar is alſo to be found in ſea-water, muſt certainly follow, from the ſea being open to, and ready to receive, all that ſprings will convey into it. All coralloeid bodies and ſhells are formed of ſpar, modified and mixed ſo as to comply with the occaſions of marine plants and animals[g]. Laſtly, ſpar is waſhed out of the cliffs and rocks expoſed to the power of the ſea; nay, great degrees of heat will raiſe it in vapour, and what riſes ſo into the atmoſphere, is doubtleſs again condenſed and precipitated by wind, cold, and rain[h]. In ſeveral parts of Cornwall we have a *lapis arenaceus* or free-ſtone, conſiſting of ſand and quartz. Near the borough of Michell there is a pretty ſtone, not long ſince diſcovered, of a cinereous ground, ſpeckled with white gravel: it works very ſmooth, and keeps a neat edge. In Gwenap there is a whiter ſtone, and in Stithien one of the ſame kind.

Polrudon ſtone (commonly called Pentowan) is likewiſe of the arenaceous kind. This ſtone lies in a lode about fifteen feet wide, not interſected by horizontal and perpendicular fiſſures, as in *ſtrata* of free-ſtone, but ſhelving, and in irregular maſſes, aud of three different colours; the firſt and fineſt of a milk-white ground, thinly beſprinkled with purple ſpecks about the twenty-fourth part of an inch in diameter; the ſecond of a cinereous ground, with more, larger, but fainter purple ſpecks; the third of a yellow ochreous ground, ſpeckled, but the purple leſs diſtinct, with ſome micaceous talc thinly interſperſed. Dr. Woodward's Cat. vol. II. page 4, had two ſpecimens (b 2, b 3, ib.) from this quarry; one of an iron-colour, and indeed an irony-water, I obſerved here to diſcolour ſomewhat of the ſuperficies of the ſtones; but in the heart, I found them always of one of the three before-mentioned colours. Dr. Woodward, ibid. calls this a free-ſtone, and not improperly, if he meant only a *lapis arenaceus*; but it is greatly different, both as to

[g] See page before, 84.

[h] See Woodward's Cat. vol. I. pa. 116—113, &c. "About Cappelſham the corals diſperſed about the ſhores uniting with the ſand, make a ſolid ſtone." Linnæus Amæn. Academ. page 463.

ground

W3. delin.

I.G. sculp.

To William Lemon Esq.r this South View of CARCLEW is most gratefully inscribd. House in the parish of Milor; Cornwall, engravd at his expence by Wm: Borlase.

ground and *charge*, from the Portland, Oxford, and Bath-ſtone; for all theſe are called free, not only for their eaſe in cutting, but for giving way to acids; whereas our Polrudon ſtone will cut indeed, but not near ſo freely as the forementioned, and will not at all ferment with *aqua fortis:* our Corniſh ſtone is cemented by a cryſtal or quartz baſis, and therefore is radically diſtinct from thoſe ſtones of Portland, Oxford, and Bath, which are concreted by a ſpar. Of Polrudon ſtone is built the houſe of Anthony in this county, Plate IX. page 92.

Of a finer cloſer grit ſtill is the free-ſtone raiſed on Illogan downs, of which the eaſtern front of Tehidy houſe, Plate X. p. 94, is moſtly built. The ornaments of the portal and windows and cornice are of Portland, but the main body of the Corniſh ſtone, which is ſo near the texture and colour of the Portland, that it requires a very near inſpection to diſtinguiſh one from the other. It unfortunately riſes in ſuch ſmall maſſes, that it will ſeldom ſquare to one foot and a half in block; and in this quarry there is ſo little found of it, that there was ſcarce enough to finiſh the front below the cornice[i].

SECT. VII. Moorſtone, or granite.

From the arenaceous let us proceed to ſtones of a larger grit. In Cornwall the moor-ſtone appears in greater plenty than any other: It is ſcattered over our hills from the Land's End through the Hundreds of Penwith and Kerrier. In Pydre Hundred there is ſome; but the flat and killas begin there to prevail and reach from Padſtow, along the North ſea, to the extremity of the county. In all the higher parts of the ſouthern hundreds the moorſtone keeps its ground; and in general we may ſay, that the higheſt tors in the county are uſually ſpread with what we call moorſtone, from its being found moſt commonly in uncultivated moory hills and vallies, for in both ſituations there is great plenty of it, but oftener indeed to be ſeen on hills, the ſame rain and floods laying ſtones bare on the tops and ſides of mountains, which cover them as often in the vallies. It is a great miſtake in Naturaliſts, to imagine, that moorſtone does not lie in *ſtrata*[k]. The ſtone-cutters indeed do not open any quarries for moorſtone[l], becauſe that would be a needleſs labour, not becauſe they cannot find moorſtone under the ground; every cliff, crag, and precipice, and a great number of mines, may convince us, that this ſtone lies in floors and layers, *ſtratum* upon *ſtratum*, interſected by horizontal and perpendicular fiſſures; for

[i] There is a very white ſtone of this kind, of a fine, ſmall, and uniform grit, which I have obſerved about the midway between the borough of Camelford and the church of St. Teath, which may very well reward a further ſearch.

[k] Hill's Foſſils, page 499. Woodward, *&c.*

[l] So many large detached rocks of this kind of ſtone appearing above ground, and the maſons ſeldom working on any in the bowels of the earth, may have occaſioned haſty memorandums, made *en paſſant*, which thence crept into collections and catalogues, and thence from one book to another.

evidence of which, we need go no farther than the rocky beach, and precipices at St. Michael's Mount. Moorſtone, where there is no defect, does not cleave to faces, as flat and killas, but breaks irregularly, as marble; yet can the maſons cleave tall columnar maſſes eight or ten feet long, and ſometimes longer, out of a block of ſtone: they do not depend on a hole full of water to ſoak and ſoften the ſtone, nor to ſeparate it into a number of pieces at random[m]; their way of cleaving it is this: Having pitched on a rock of proper ſize, they line it out, and in the lines ſink with a pointed inſtrument, called a pick, ſeveral holes, about three inches deep, as many wide, and four or five inches long. Having prepared theſe holes, they inſert a large iron wedge, called a gad, in each hole, and line the wedges on each ſide with a thin piece of iron plate; two of the maſons then (each furniſhed with a ſledge) drive the wedges in an equable manner, and the ſtone will cleave the whole length deſired.

That this ſtone is of the ſame nature with the Oriental granite, is now no longer to be diſputed; by that name therefore, as better known, I ſhall henceforth diſtinguiſh it, and range the ſeveral ſorts I have met with in Cornwall according to the ſeveral colours of their *grounds:* for perſpicuity ſake, let the reader obſerve, that in ſuch compound ſtones as this, the prevailing matter or cement of any ſtone is called the *ground* of that ſtone, and the ſpots, veins, or variegations fixed in that cement, I ſhall call the *charge* of that ſtone, as we might with equal propriety (if it were not to multiply names) call the *ground* of any ſtone the *field* of that ſtone.

Five ſorts of this granite I have obſerved, the white, the duſky or dove-coloured, the yellow, the red, and the black.

White. In the pariſh of Conſtantine, in the Hundred of Kerrier, there is great plenty of this ſtone; the *ground* of ſeveral degrees of whiteneſs; the whiteſt of all, which is the beſt, conſiſts (as to its *ground*) of milk-white opake, tabulated, gloſſy grains of quartz, the grains rectangular, and uſually columnar, from the fourth of an inch and leſs in diameter; the *charge* conſiſts of brown and bright ſilvery *micæ* of talc, about the tenth of an inch diameter; the *ground* is ſo white, that the brown talc has the appearance of black, when it is near and fronts the eye; but at a little diſtance, the *ground* prevails ſo much, that this ſtone, for many years after it is wrought, looks abſolutely white: it is of a cloſe grit, cuts well into moldings, in a moderate fire grows ſomewhat whiter and more brittle, but without mixture will not vitrify in a ſtrong fire, gives fire with ſteel, ferments not with *aqua fortis:* it has a very good effect in

[m] Hill's Foſſils, page 499.

building,

To the R.t Hon.ble Francis Earl of Godolphin of Breag, Cornwall, engravd at his expence this View of Godolphin House in the Parish is most gratefully inscribd by

Wm Borlase.

building, is free in working, yet hard enough for every kind of ſtone-work in water as well as out, and much ſuperiour to Portland for ſteps and water-works: it is alſo ſent rough-hewn to Briſtol in large ſlabs, which are there further poliſhed for caſting thin broad plates of copper. The pyramid in Arwinek grove at Falmouth, is ſolid, and built of this ſtone. It was erected by the late Martin Killigrew of Arwinek, Eſq; in the years 1737 and 1738, at the expence of 455 Pounds, fourteen feet wide at the bottom, and forty feet high, each ſide correſpondent in number and ſize of ſtones to the front here exhibited, Plate XXIV. Fig. vii. the middle layed with roughly-ſquared ſtones, and their interſtices filled with liquid cement; ſo that a more durable work can ſcarcely be imagined; and great pity it is, that it was not placed as conſpicuous as its ſolidity deſerves. Gentlemen face the fronts of their houſes with this ſtone to good effect, as may be ſeen at Carclew, the ſeat of William Lemon, Eſq; Plate XI. page 96, and other places. Of two ſpecimens weighed in the hydroſtatic balance, one weighed to water as 2 - - $\frac{58}{62}$ to 1, the other weighed only as 2 - - $\frac{7}{10}$ to 1 [n]. There is a very good granite of the ſame kind in Karn-mêl-bal in St. Juſt.

In the pariſh of Madern there is a very pretty moorſtone, but rare; the *ground* milk-white, gloſſy quartz or coarſe cryſtal, the *charge* conſiſting of large black ſpots of cockle. Rochrock, in the pariſh of Roch, differs only from this, that the *charge* is ſmall black ſpecks, from the tenth of an inch and under, very numerous, thickly and equally diſperſed, ſo as to be of a mottled colour: this ſtone is in large maſſes. The tendereſt and freeſt kind of this ſtone, and neateſt for moldings, is that of Tregonin, in the Pariſh of Brêag, of which is built the portico of Godolphin houſe, the ſeat of the Right Honourable the Earl of Godolphin, Plate XII. and the New Church at Helſton, the donation of the ſame munificent Lord. The *ground* is of a white, opake grit, tender almoſt as clay, interſperſed with granules of quartz, cinereous, tranſparent, laminated, ſmall from the eighth of an inch and under. The ſtone is ſoft, and eaſy for working, eſpecially when firſt raiſed, but afterwards hard and laſting; extreamly white when newly wrought, but apt to contract a moſſy green hue in time. It weighs to water as 2 - - $\frac{29}{63}$ to 1. Of all the granite kind in Cornwall, this, if I have been rightly informed by a gentleman [o] who has tried many experiments this way, is moſt proper for making porcelain.

In the pariſh of Ludgvan [p] there is a ſingular kind of granite; Dove-coloured.

[n] By which, as well as many other experiments, it appears, that in parts of the very ſame concrete ſtone the *ground* and *charge* are mixed in different proportions, and that there is no determining preciſely, but only in general and at a medium, the weight of any ſort of ſtone by experiments made upon any ſpecimen.

[o] Mr. Cookworthy of Plymouth.

[p] Rectiùs Ludvon.

the

the *ground* dove-coloured tranſparent quartz, the grain from one-ſixth of an inch diameter downwards: there is a cryſtalline, farinaceous, ſmall ſand, incloſed betwixt the grains, with a vaſt quantity of ſilvery talc interſperſed; at the diſtance of two inches, generally more, is a ſpot of black cockle, half inch or under in diameter; when the ſpots are larger, they are more diſtant. It is commonly called the Silver Stone; and indeed is of great luſtre in the microſcope, every other granite placed by its ſide looking flat and tame. It is much coveted for walling in aſhler-work, being tough, keeping a good edge, and working eaſy. One ſpecimen weighed to water as 2 - - $\frac{84}{129}$ to 1; the ſecond, of a more yellow *ground*, weighed more, *viz.* as 2 - - $\frac{82}{110}$ to 1. It imbibes water ſtrongly, makes no effervescence with acids, gives fire with ſteel; being calcined, the black ſpots go off, even in a ſmall fire; the talc will perpetually keep its colour, though the other parts grow brown with age; perhaps it might do very well for ſilvering *grounds* for paper-hangings, and all the uſes of talc.

Yellow granite.

Of yellow granite there is a great quantity; the *ground* brown-yellow, ſpeckled throughout with black foliaceous talc of the fourth of an inch diameter and under; the *charge* dark, cloudy, many grains of cockle from the fourth of an inch and under in diameter, intermixed with large, toothy, whitiſh, opake priſms of quartz, from an inch and half long by an inch wide and under. The *ground* of this ſtone being ſo porous, and the *charges* ſo frequent, large and hard, make it one of the moſt ſhattery granites we have, fit only for rough works, where neither ſquares, ſharp edges, nor moldings are required. It weighs to water as 2 - - $\frac{84}{145}$ to 1: it imbibes water ſtrongly, and diſcharges it as ſuddenly; ſo that walls of it muſt be very damp.

Much better is the yellow granite of Tregonin. Its *ground* is yellow, and being ſomewhat earthy, not more firm than the former; but then the grains of its *charge* are but from the ſixth of an inch diameter downwards, and its black ſpecks of talc from the eighth of an inch diameter and under, ſeeded ſo thick, as to be ſeldom more than the eighth of an inch diſtant. This is a very beautiful ſtone, works as well as the white Tregonin before-mentioned, and is therefore reckoned among our beſt granites; although I muſt obſerve, that the *ground* is ſo very earthy and tender in both, that it can never bear a high poliſh. It weighs to water nearly as the white of this place, *viz.* as 2 - - $\frac{72}{113}$ to 1: imbibes moiſture ſtrongly, but evaporates it ſlowly, and is therefore much dryer for walling than the foregoing.

Red granite.

On the lands of Treaſſo, in the pariſh of Ludgvan, there is a granite of a red *ground*, quartz laminated with oblong, lucid, rhomboidal

rhomboidal ſcales, from the fourth of an inch diameter and under. The *charge* conſiſts of duſky cinereous granules, in ſome places dark and fibrous as cockle, not only granulated, but veined; the *ground* and *charge* equally hard. This ſtone at Treaſſo is exactly the ſame in ſtructure and colour as the red Egyptian granite, and lies in a vein about a bow-ſhot from the houſe, croſſing the publick road which leads to Caſtelandinas, and may prove better at depth than at the top, where I found it. It weighs to water as 2 - - - $\frac{77}{140}$ to one.

Of a richer kind is the red granite firſt taken notice of by the diſcerning Right Honourable Lord Edgcumbe, by whoſe directions tables were firſt made of it, and very handſome ſtands for buſts and vaſes. In the new hall, at Mount Edgcumbe, have been lately erected two chimney-pieces principally of this kind of ſtone; and indeed to this noble Lord this beſt of our Corniſh granites remarkable for its bold ruddy colouring and high and durable poliſh, is chiefly indebted for being reſcued from obſcurity, and eſtimated at ſo high a price as it is at preſent by the curious.

Black granite

In the pariſh of Ludgvan there is a granite of a black cockle *ground*, charged ſo thick with white ſpots of ſemitranſparent quartz, from an inch long by half inch wide and under; that the *charge* almoſt rivals the *ground* in quantity, it is much harder than the dove-coloured granite of the ſame pariſh, and weighs to water as 2 - - $\frac{108}{137}$ to one.

A better ſtone of the black kind is found at Boſworlas, in the pariſh of St. Juſt; the *ground* is of a blacker cockle than the foregoing, and is interſected in all directions by toothy maſſes of a warm fleſh-coloured quartz, moſtly in the parallelopiped ſhape; ſometimes curved, now and then in a zig-zag manner, and ſometimes in the form of a croſs; in diameter, from half to one-ſixth of an inch, by two inches long and under. The *charge* in depth conſiſts of two *ſtrata* (ſometimes three) of *laminæ*, from the twentieth of an inch thick and under, with lucid ſurfaces parallel to one another, but lying at different angles with thoſe of the adjoining *ſtratum*; ſo that when one is oppoſed to the light and ſhines, the other, which abutts at the end of it, does not. This is a moſt curious and beautiful ſtone, extremely hard, may be had in large pieces, and will doubtleſs with labour attain to a high poliſh for tables and ornaments. It weighs to water as 2 - - $\frac{85}{129}$ to 1.

SECT. VIII. Of the Corniſh marble.

The marble we have in Cornwall is not remarkable either for its beauty or uſe. In the pariſh of Carantoc, and at New Kaye, in Lower St. Columb, there is a coarſe cinereous marble veined with white ſpar: it ferments ſtrongly with *aqua fortis*, gives no fire with

ſteel, weighs to water as 2 - - $\frac{98}{136}$ to 1. The ſpecimen weighed in air fifteen penny-weights ten grains; and after being immerſed three minutes, and carefully wiped, it weighed fifteen penny-weights ten grains and half, by which it appears, that this marble admitted no water at all into its pores. It burns to a whiter colour, but makes no ſign of fermenting afterwards, when ſprinkled with common water. Much better is the marble about a mile north of Padſtow, at a place called Pormiſſen, where there are in the cliff great quantities of marble, the *ſtrata* one foot and half thick at a medium, intermixed with ſhelfy ſlat; the marble is ſometimes cut into chimney-pieces and tables, makes ſlabs for hearths, and ſmall ſquares for inſerting between the angles of free-ſtone pavements; the ground of it ſomewhat blacker than the foregoing, and the veins wider; as to the *ground*, grit, texture, finer and cloſer; the fermentations with acids the ſame[q]: it takes a very high poliſh, but ſo hard withal, that perhaps Italian marble is full as cheap *. Among the Corniſh marbles, according to Linnæus's Syſtem, (ſee page 156) we muſt reckon a fine gypſum or plaiſter of Paris, diſcovered lately in the pariſh of St. Clare, near Liſkerd, equal to any thing of that kind found abroad.

SECT. IX. Of the weight and dampneſs of ſtones.

It may not be here unſeaſonable to add a remark or two upon the weight and dampneſs of ſtones in general, and of the foregoing in particular. As by weighing them in water we diſcovered their ſpecific gravity nearly, with regard to one another and to the common ſtandard-water; ſo by weighing them carefully wiped after their immerſion, we may perceive what quantity of water has entered their pores, and in what time, which may lead us to ſome uſeful obſervations; and, among the reſt, to eſtimate the dampneſs of each ſort of ſtone in walls and pavements; for according to the quantity of water imbibed in any given time, and its ſlowneſs or readineſs to remit and evaporate that moiſture, ſo will be the dampneſs of any wall built of that ſtone with like and equal cement. If it retains as well as imbibes, then it muſt be ſaturated with water before it can occaſion any damp; and therefore the free-ſtone of Carantok, and any other of like nature[r], imbibing freely, and retaining greedily, will ſuck entirely into its body all the common moiſture of the air and cement, and keep it there without imparting any perceivable quantity to the inſide of the wall or room. If it imbibes water ſuddenly and as readily parts with it, as ſome of our granites do, it will infallibly occaſion damps within and without; it will diſperſe it's dampneſs inwards, yielding it to the

[q] Dr. Woodward takes notice of marble nodules variegated with brown, red, and white, from the ſhores of the Land's End. Cat. A x, b 7.

* There is a blue-black ſtone of a marble texture found on Gunhilly downs; I have noted it alſo in the pariſh of Kilkhampton: it cuts into neat moldings, and bears carving: it will not ferment with acids.

[r] Portland, Bath, and Oxford.

attraction

attraction of the greater heat within a room or wall, than there is on the outside of the wall. If it be so hard that it will not admit of any water into it's pores, which is the case of some marbles, it will however occasion great damps, by condensing the moisture of the air (which would otherwise gently disperse and vanish) into water, to such a degree, that pavements, ornaments and pannels, of such marble, shall sweat (as the usual phrase is) and even run with water. It being the usual and just method to line walls with brick, to make the walls wholsome and dry, in order to discover by what means bricks obviate damps, I made the following experiments in July, 1755. I took two bits from off the same brick, of the closest and most uniform texture; N°. 1. weighed in air, 314 grains; after it had been immersed five minutes in water, it weighed (after being carefully wiped with a linen cloth) 368 grains, so that it imbibed, by an immersion of five minutes, 54 grains, which to it's whole is as one-fifth - - $\frac{44}{54}$.

N°. 2, weighed in air 326 grains, but after an immersion of five minutes, 392 grains, having imbibed 66 grains; the same brick having one of it's angles placed contiguous to some drops of water, sucked up still more; a third specimen of like consistence, which had not been immersed at all, on touching some drops of water sucked them out of sight immediately. By these experiments it is plain, that brick does not obviate damps by it's aversion to, or repulsion of water, because it imbibes water more rapaciously than any stone.

I placed therefore both these pieces of brick so charged with water, in a South dry window, July 15, 1755, at nine o'clock, a. m.; by twelve at noon N° 1 had evaporated five grains, by half past three, p. m. it had lost five grains more; at five it had rather gained than lost (the weather proving rainy); by three quarters after six, p. m. it had lost only half a grain in three hours and a quarter, the weather continuing cloudy, with some rain; at half hour after five the next morning, July 16, it had lost more, four grains and a half, and by nine, a. m. which compleated the 24 hours, it had lost more, four grains; so that in 24 hours this piece of brick had evaporated by natural heat, nineteen grains, which, to fifty-four, the quantity imbibed is somewhat more than one third.

N°. 2 had been purposely for a moment or two, put contiguous to water again, to try if it would imbibe more moisture than it's immersion had supplied it with, and yet in 24 hours, this specimen evaporated only sixteen grains, viz. one quarter and two sixteenths of what it had imbibed.

So retentive is brick of that moisture which it admits; by which it appears that brick obviates damps, not by resisting or defending

* See Carantoc marble above.

the

the moiſture of weather, improper ſtones, and broken cement, but by firſt imbibing ſtrongly, then arreſting and detaining the damps, and draining the cement ſo as that it cannot tranſmit its dampneſs through the walls: this brick will do till it is ſaturated with redundant moiſture, and then it obviates damps no longer; and it follows, that the more our granites partake of the nature of bricks, the dryer they are for walling; on the other hand, the more they admit and condenſe, and the eaſier they quit and diſperſe the moiſture they receive, the greater damps they occaſion, keeping the body of the cement, and every thing contiguous, in a continual unwholeſome ſtate of moiſture.

CHAP. X.

Of Stones of Ornament and Curioſity, viz. *Pebbles*, *Flints*, *Porphyry*, *Talc*, *Stalactites*, *Aſbeſtos*, *and ſmall Gems found in Cornwall.*

THERE are no gravel pits where pebbles and flints lie in heaps and *ſtrata* at preſent diſcovered in Cornwall, which have reached my knowledge, but nature has made ſufficient amends by beſtrewing the beach of our bays and creeks with an infinite number of pebbles, flints, and nodules. Here therefore the curious Naturaliſt will find, ſpread as it were for his better obſervation, a large collection, wherein, though there are many duplicates, yet is there a greater diverſity of curious ſtones on a beach of a few furlongs, than are to be found in ſome hundreds of miles, travelled over in the inland country. When the learned travel, they only take notice of, and collect what is rare to them, or not yet deſcribed; whence it happens oftentimes, that thoſe things which are reckoned among the moſt entertaining products of nature in other countries, lie on our own ſhores neglected, merely becauſe they are well known to the Literati, and found in other places by the occaſional viſitors of this, and other particular counties.

I ſhall range the pebbles by the colour of their *grounds* as I have done before by the granites.

SECT. I. N°. 1. Of the white pebbles ſome are veined like marble, ſome clouded with a lively fleſh-colour, ſome variegated with purple and other ſpots, as well as veined, others charged with black pebbles, ſome rough and gritty to the touch, others ſmooth, ſome tranſparent as rock cryſtal. Of this laſt ſort I have ſeen a ſeal cut out of (what the lapidaries call) Pebble Cryſtal, extreamly bright and clear: the pebble was found, as I am informed, on the top of Routor, the

the higheſt hill in Cornwall according to my eſtimate[t]. It is alſo found in our mines, but ſeldom; the only one I have ſeen was taken out of a mine, called Huel-royal, in Camborn; it was quite ovular, half uncovered and half fixed in a ſocket of angular and puculated cryſtal; one inch and half long, and one inch and one-fifth wide: but our white pebbles are moſtly of an opake white quartz.

N°. 2. Of the yellow kind our pebbles are uſually of a high poliſh and amber-like ſubſtance, differently clouded, veined, or ſpotted, with other colours.

N°. 3. Pebbles of a green ground are rare with us, none which I have met with tranſparent; in ſome the willow-green is charged with pale-yellow cryſtalline granules, the *charge* prominent, ſhewing that it is of a harder firmer conſiſtence than the *ground*.

N°. 4. Of the ruddy *ground* ſome of a faint lake-colour have large irregular granules of opake white quartz ſunk in them, thereby approving themſelves ſofter than the *ground*.

Of the brown-red ſome are of a high poliſh, fine texture, clouded with red interſected by a blackiſh vein, plainly of the agate kind.

N°. 5. Pebbles of the blue *ground* are very differently charged; one of a blue killas is ſeeded with innumerable little micaceous ſpots, of ſo faint a caſt as ſcarce diſtinguiſhable from the *ground*, the *charge* a thin ſprinkling of opake white quartz; the ſtone is porous, and to the touch feels rough, as any granite pebble.

Another of blue killas is charged with pale, fleſh-coloured, toothy grains, from an inch diameter and under, and differs only from the Boſworlas granites (beforementioned page, 101) in this, that its *ground* is blue inſtead of black.

Of a blue-black, ſome are of a very high poliſh, and cloſe texture.

N°. 6. Of the black ground, ſome pebbles are ſo equal a mixture of ſtriated gloſſy cockle and white quartz, that were not the latter in diſtinct granules from the fourth of an inch and under, it would be difficult to decide which is the *ground* and which the *charge*; it is a pretty mottled ſtone, but rough and ſcabrous to the touch.

A black flattiſh pebble, ſmooth, but of no great poliſh; its fibres parallel and longitudinal; it has the properties of a true touch-ſtone. It was brought me from the ſea-ſhore in the pariſh of St. Kevran, and ſeems to owe its pebbly figure to the attrition of the waters; ſo that it is not unlikely that there ſhould be thereabouts ſome courſe of black marble of the nature of the *lapis Lydius*,

[t] In Oxfordſhire they ſometimes find ſuch pebbles wholly pellucid, about the bigneſs of a wallnut. Woodward's Cat. vol. I. page 32.

or Chian marble of the ancients; although any black hard marble will indeed anſwer the purpoſes of a touch-ſtone.

N°. 7. Jaſpers are to be found among our pebbles, more eſpecially of the black and yellow kind; but of the green jaſper I have yet ſeen none found in this county.

SECT. II. Flints.

It has been generally held by Naturaliſts that we have no flints native in Cornwall, but this is a miſtake. Betwixt the towns of Penzance and Marazion there is a beach of pebbles two miles and three quarters long, among which many hundred flints may be picked up every day; and leſt it ſhould be inſinuated that theſe flints may poſſibly be foreign, and brought in ballaſt by ſhips, I muſt obſerve, that in the low-lands of the pariſh of Ludgvan, ſcarce a muſket-ſhot from the ſaid beach, in a place called the Vorlas, there is a *ſtratum* of clay about three feet under the graſs: the clay is about four feet deep. In this clay, immerſed from one to four feet deep, (ſometimes deeper) flints are diſcovered in great numbers, their ſize from the bigneſs of a man's fiſt to that of a bean, their coat nearly of the colour of the clay, (as in chalk we find their exteriour infected with the chalk-bed in which they lie) and their inward part died with the ſame colour more than half way; the other part, near the middle, a common, corneous, brown flint. In the ſame bed of clay, I find ſea-pebbles of opake white quartz, and ſome ſhingle; ſufficient and evident veſtiges of the univerſal deluge. I find alſo many ſmall blue killas ſtones, with all their angles on; an equal evidence, that as the advancing waters of the deluge introduced the productions of the ſea, ſo the departing waters of the ſame cataſtrophe frequently depoſited ſtones and fragments of ſtones from the hills: both ſhew, that the *ſtratum* remains as it was left by the flood, and are conſequently teſtimonies that the flints found in it muſt be native, and the growth of Cornwall. The flints of this bed of clay are brown within, but on the beach we have a remarkable variety, and one now before me of an opake white, is of as fine texture, and as high a poliſh, as any Carnelion I have ever ſeen.

SECT. III. Shape and varieties of pebbles, and their cauſe enquired into

Pebbles found on the ſea-ſhore are generally of the ſame flattiſh oval ſhape. This ſhape is therefore attributed (and for the moſt-part not unjuſtly) to the agitation of the ſea, which, by continually rolling them to and fro, againſt the rocks and againſt one another, wears off the angles, and neceſſarily reduces them to their globular figure: but what exerciſes the attention of the curious, is, that pebbles are oftentimes found in clay and gravel-pits many miles from the ſea, and yet of the ſame orbicular ſhape as thoſe on the

ſea-

ſea-ſhore; nay, ſome of theſe inland pebbles are ſometimes large from ten to twenty inches, and ſome three and four feet diameter. The queſtion therefore is, Whence this ſimilarity of ſhape? How come the inland pebbles to be of that ſhape, which, in ſuch numerous inſtances as the ſea-ſhore and rivers afford us, is manifeſtly owing only to the agitation of ſea and river-waters. Dr. Woodward (who left few parts of Natural Hiſtory unattempted, and many particulars very ſucceſsfully explained) labours hard to prove, that the inland pebbles are indebted to the departing waters of the Deluge for their roundneſs; and that theſe waters had the ſame effect upon them as the ſea upon thoſe of the ſhores: but it is very juſtly replied to this opinion, that the departing waters of the deluge had neither time nor ſufficient force in general, nor violence of agitation enough in all ſituations to produce the effect in queſtion; the cauſe therefore aſſigned is not equal to the effect, and all the phænomena in pebbles produced by him [u], may be rationally accounted for upon much leſs diſputable principles [w]. The truth is, this pebbly form is either natural or adventitious; where the form is adventitious, it is owing either to the force of ſea or river-waters; on the ſea and river-beach thoſe pebbles of the ſofter kinds, and thoſe which appear to have been fragments of the adjoining rocks (or nodules which never arrive to the ſize of rocks) owe their roundneſs to the neighbouring waves; at the ſame time it muſt be confeſſed, that many which are on the ſhore, as well as moſt of the inland pebbles, are really found in their own original, and natural form in which they firſt concreted. Natural pebbles may be ſafely diſtinguiſhed from factitious; firſt, by their having a coat or ſhell moſtly of an even thickneſs, but of a different colour from the inward ſubſtance of the ſtone; ſecondly, when the pebble has a nucleus in or near the center, round which the body of the pebble is formed in *ſtrata*; thirdly, when the fibres of the body ſpring like rays from a central point; fourthly, thoſe pebbles, which have nodulous bunches or excreſcencies of equal hardneſs to the reſt of the body, may be looked upon as in the ſame ſtate and figure which nature left them in; fifthly, if a pebble ferments with acids, it is not a natural one (Hill, page 406); but whether this criterion be concluſive may be queſtioned; for I cannot ſee why ſtones of a ſparry baſe may not be formed into a pebbly figure by the ſame

[u] *Ibidem ut ſupra & paſſim.*

[w] The ſtone which Dr. Woodward (*ibidem ut ſupra*, page 47,) lays ſo much ſtreſs upon, may be explained without having recourſe to the departing waters of the deluge. This ſtone conſiſts of ſeveral ſmall pebbles cemented together into one nodule. No more need be ſaid, than that the *ground* and the *charge* might be liqueſcent at the ſame time; and though by the attraction of ſimilar parts the little pebbles were kept together in ſeparate maſſes, and the cement, at the ſame time that it furrounded them, repelled them to their own limits, yet being both ſupple enough to conform to the force of external bodies, they became compreſſed and rounded, and formed one nodule under one convex ſurface.

principle which forms thoſe of a cryſtal baſe, that principle being adventitious, not natural to either: however that be, it muſt not be imagined, that the reverſe will hold good*; for we have many factitious pebbles (of Porphyry for inſtance, and others of cryſtalline baſe) which will not ferment. To theſe criterions ſome authors add, that they break irregularly [x]; whereas factitious pebbles break to faces. How this natural figure therefore comes to correſpond ſo perfectly with that which is factitious, muſt be our next enquiry. A modern author obſerves, that one part of the pebbles is more compreſſed than the other, which he therefore rightly terms their baſe, and argues very juſtly, that the lumps of which they are formed, muſt have been at one time or other in a ſtate of ſoftneſs and liquidity; that, floating in a fluid medium before they were hardened, they were rolled to and fro, if that medium was in violent motion, ſo as to become round; if that medium was in little motion, then they only became roundiſh; if at perfect reſt, then ſtill more flat. Theſe are ingenious conjectures, and the author [y] deſerves commendation; but there muſt have been ſeveral other concurring cauſes: To what is here ſuggeſted then, let us add the equal preſſure of the fluid medium on all ſides upon the ſtone-maſſes during their liqueſcent ſtate; for we know that water will form melted lead, properly mixed, into a globular figure: Again; the mutual attraction of ſimilar parts will form fluid bodies into a roundneſs, as we may ſee by drops of dew and quickſilver. All theſe cauſes muſt, I ſhould think, be admitted; nor are we to forget, that the innate force of the materials, the peculiar ſalt, ſulphur, mineral, or metallick earth, of which the ſtone is compoſed, muſt have been ſupple, and complying with the other forces, and not have any tendency to angular or rectilinear figures, or pebbles could not have been rounded at the time of their concretion.

Thus much for the natural and factitious ſhape of pebbles, the latter being occaſioned by the agitation of water, and the natural formed in water, partly by its fluctuations and equilateral preſſure, and partly by the mutual attraction and conſent of the *moleculæ*, of which ſuch ſtones are compoſed. As to the other properties of pebbles, whereby they differ from one another, I ſhall only hint, that if the component parts were ſmooth, fine, and ſmall, the body formed of theſe will be of a cloſe texture and gloſſy ſurface; if we find the inward ſtructure uniform, it will intimate the unmixed nature of the materials; if in layers of different earth and cement, we are to impute them to ſucceſſive applications of different ſubſtances, indurated at different but no very diſtant times;

* That all pebbles, which will not ferment, are natural ones.

[x] Dr. Woodward's Catalogue, vol. I. page 29.

[y] Hill's Hiſtory of Foſſils of the Telaugium, page 555, *&c.*

if

if they are interſected by ſeams of ſtone different from the body, the reaſon poſſibly may be this; that as the body was contracting itſelf in order to induration (contraction or approximation of parts being a neceſſary concomitant of induration), or after induration cleaved by force of fire or accident, a fiſſure enſuing, that fiſſure was filled with the adjoining matter, repelled by the ſubſtance of the body, and formed of its own uniform parts by mutual attraction betwixt themſelves and excluſion of others. If there are unevenneſſes in the ſurface of pebbles (as was the caſe with many, which made Dr. Woodward recur to the agitation of the waters of the deluge) ſome parts being more prominent than others, or if there are looſe nucleus's incloſed within the central cavity, as is the caſe of the Ætites[z], it need only be ſuggeſted, that theſe phænomina may reaſonably be attributed to the different contractile powers of the materials of which theſe unevenneſſes and central nucleus's conſiſt; it being certain, that if the body of a ſtone contracts itſelf, in order to induration, into a cloſer ſubſtance than the ſeam, *ſeptum*, or granulated *charge*, that *charge* or ſeam will be more prominent than the body, and *vice verſâ*; and if the ſubſtance of the nucleus, during the time of induration, contracts itſelf after and more than the ſubſtance of the ſhell which inveſts it, that nucleus will have a vacancy round it, and become looſe in its cell, the nucleus being a concretion poſteriour to that of the ſhell, and breaking looſe from the inner coat of the ſhell by the contractile powers of its own conſtituent parts. Laſtly, of pebbles: Some are evidently formed ſince the deluge, for we find ſhells, coralloid bodies, and echinites in them; whether thoſe which carry no ſuch evidences were formed before, at, or long ſince the deluge, it is impoſſible to determine.

SECT. IV. Nodules.

From pebbles, let us paſs to nodules of curious ſtones found in Cornwall. Having found ſome pebbles of porphyry on the ſea-ſhore, upon farther ſearch I diſcovered a ſtone of the ſame kind in the pariſh of Philac, among the ſand-hills: it is of a ruddy-purple *ground* (not ſo red as the Egyptian) charged with granules rectangular and oval, from the eighth of an inch diameter and under, nearly of the ſame colour with the *ground*, but paler with gloſſy ſurfaces, interſperſed thinly with opake white granules of quartz of like ſize and ſhape to the foregoing, mixed with ſome black ſpecks of cockle of the ſame ſize. It weighs to water as $2 - - \frac{84}{126}$ to 1 [a].

N°. ii. Part of a large nodule of like porphyry found in my garden, had its granules larger, but no white interſperſed. One

[z] One of which, of a hard brown flint-like ſtone, about an inch in diameter, was found in 1757, near Penzance Kaye, among the ſea-pebbles, and brought me September 17, 1757.

[a] This ſeems to be the pophyrites leucoſtictos of the ancients.

pebble of like kind is charged with yellow ſpots of a light-ochre colour, from the ſixth of an inch diameter and under.

N°. iii. A very blue violet purple *ground*, granules lighter coloured, thinly diſperſed from the eighth of an inch and under in diameter, a beautiful ſtone from the beach in Mount's-Bay.

N°. iv. We have alſo the porphyrites with larger grains, and a green *ground*, which ſtone though not of a purple colour, yet, being of like conſiſtence and texture, muſt be ranged alſo among the porphyrites.

N°. v. Dr. Woodward takes notice of "a ſtone [b] finely varie-
" gated with ſpots of red and white, with flakes of white talc in
" it, found near Calſtock, in Cornwall, called with us the Worm-
" Seed Stone, becauſe thick ſet with ſmall bodies not unlike the
" Semen Santonici, or Worm-Seed, ſomewhat related (ſays he) to
" the porphyry kind."

I have yet found theſe porphyries only in nodules; but ſo many being to be ſeen, eſpecially after a ſtorm, on the ſea-ſhore of Mounts Bay, particularly near Pons-an-dane river, in Gulval, it is not unlikely that there may be ſome veins or *ſtrata* of them in the ſunk rocks under the ſea, though I have, upon my ſearches among the rocks at low-water, not diſcovered any. The porphyry was thought formerly peculiar to Egypt, and much admired for its colour and hardneſs. The ancients had a method of working it with tools, but that method is as yet unknown to the moderns. It is a cloſer-grained kind of granite, with its *charge* or ſpots more neatly placed, and more diſtinctly finiſhed.

SECT. V. Of ſtalactites and alabaſter in Cornwall.

It has been generally held, that in Cornwall we have no ſtalactites, but this is a miſtake; for ſome ſmall drop-ſtones or ſtalactites have been ſent to the Royal Society from Pendinas caſtle, ſaid to have had a ſtrong ſcent [c]; and in the caves of a cliff, near the Holy-well, in the pariſh of St. Cuthbert, there are ſeveral ſtillatitious productions of a ſparry kind. Some are gritty, and their grit little harder than chalk; others are more ſtony, and hang from the roof in fangs, like the anemone root, but ſometimes in ſmall tubular ſtalactites with green and ſometimes red effloreſcencies. The ſame ſparry juice forms large bunches of ſtone on the ſides of the caves, and as it drains through the ſand, and blown fragments of ſhells, fixes both, forming itſelf into thin prominent wavy edges, with quadrangular cavities between, making a pretty kind of fret-work. On the floor of theſe caves the ſame ſtony juice forms a more uniform maſs, ſpreading itſelf into a fluor of the alabaſter

[b] Cat. vol. I. page 64, d. 36.

[c] Grew's Muſ. R. S. page 320.

kind

kind. The *ſtrata* of this incruſtation are as many as the ſucceſſive indurations, eaſily diſtinguiſhed, the under-part of each *ſtratum* being browner and more earthy, the upper-part more white and pure, the more impure parts of the liquid ſettling neareſt the bottom. The ſamples I have from theſe caves, are from half inch to ſix inches thick, coating the protuberances, as well as the depreſſions of the rocks they fall upon, uſually at one thickneſs; but where the rock upon which this fluor fixes is concave, and the edges of that concavity upon a level, the alabaſter is thicker, better clouded, and of a cloſer grain, and conſequently fitter for poliſhing, and making larger vaſes. The upper-parts of the incruſtation is covered over with a kind of purple powder, a ſort of mineral efflorеſcence [d], calcarious, fermenting ſtrongly with acids [e]; in the microſcope it appears woolly, and like the ſhoots of damp vitriolic ſubſtances; but that the filaments which ſhoot from vitriol are white, and the threads of this ſalt are tranſparent purple croſſing each other in all directions.

SECT. VI. Warming-ſtone.

The learned Mr. Ray mentions the warming-ſtone digged in Cornwall, which, being once well heated at the fire, retains its warmth a great while. Dr. Plot (Oxfordſhire, page 258) ſays this ſtone will continue warm eight or ten hours [f], and gives relief in ſeveral pains, particularly in thoſe of the internal hæmorrhoids; and Charlton de foſſ. Onomaſt. Zoicon. page 243, calls it, *Lapis Schiſtos duriſſ. & ſolidiſſimus apud Cornubienſes* Warming-ſtone. In Yorkſhire they have a ſtone of this property, conſiſting of dark-grey gloſſy talk with ſome white ſpar interpoſed betwixt the flakes of it, which, Dr. Woodward (Cat. vol. I. page 62, ☉ d. 7 †.) ſays, the people lay in their beds in cold weather at their feet, becauſe, when once heated, it retains the heat a great while [g].

Swimming-ſtone.

In a copper-mine, called Nancothan, near Redruth, they have a ſtone which they call the Swimming-ſtone. It conſiſts of rectilinear *laminæ* as thin as paper, interſecting each other in all directions, and leaving unequal cavities of various angles between the *ſepta*. The ſtructure is therefore very cellular, and makes the ſtone ſo light, that it ſwims on water. It is of a yellow goſſan colour, and as to its exteriour, has ſome reſemblance to a light kind of cavernous *lapis calaminaris*, which I have had from Wirkſworth, near Derby. I have not heard of this ſtone's being found any where in Cornwall but in this work.

[d] Suppoſed to be the flowers of cobalt.

[e] I have obſerved the ſame purple efflorеſcencies on a damp ſtuckoed wall in the chapel at St. Michael's Mount.

[f] In which quality however it is inferiour to the Spaniſh Ruggiola (mentioned in Willughby's travels through Spain, page 471), which are broad plates, like tiles, cut out of a mountain of red ſalt near Cardona, which, being well heated on both ſides, will keep warm twenty-four hours.

[g] Hill, page 553, calls this ſtone the blueiſh white brittle Telaugium.

Of

SECT. VII. Of talc in Cornwall.

Of the brown foliaceous talc, a tin-work, in the pariſh of St. Juſt [h], affords a fair ſpecimen; the leaves thin and elaſtic from the fourth of an inch downwards in diameter, of no determinate figure, nor inſerted in any order. In the microſcope the leaves are of a tortoiſe-ſhell tranſparency and colour. It is found in a bed of ruddy ſpeckled granite, to which it adheres [i].

N°. ii. A much more beautiful foliaceous talc I have from a cliff near the Lizherd, of extream thinneſs, fine texture, tranſparency, and ſilver hue: the leaves were in diameter but half inch downwards, being broken ſmaller than their natural ſize before I had them. It is the *Mica particulis membranaceis fiſſilibus diaphanis* *.

N°. iii. A ſpecimen of the ſame kind of a browner, more corneous colour, leſs flexible, and its membranes larger [k].

N°. iv. Radiated ſilvery talc. In a bed of milk-white tabulated quartz. The rays are an inch and a quarter long and under, conſiſting of ſeveral membranes of talc one-fourth of an inch long by one-ſixth of an inch wide, in the ſhape of the leaf of a peach-tree: they lie in ſtraight lines, ſpringing as it were from a centre [l].

N°. v. The ſhining gold-coloured talc, or *mica aurea*. The micæ are of ſilver as well as gold-colour, but leſs diſtinct; neither of them elaſtic: they lie longitudinally in parallel flakes, one on the back of another, and between them have white cryſtalline ſhivers; but what part of Cornwall I had this from, I do not recollect.

SECT. VIII. Of the aſbeſtos found in Cornwall.

Of the ſolid aſbeſtine talc we have before taken notice, that it is ſometimes found adhering to the pureſt ſpecimens of the ſteatites *Cornubienſis*, or Soap-rock. The ſame ſubſtance is ſpread like an enamel on the ſurface of the rocks expoſed to the ſea. This is near of kin to the Ophites, or Serpentine marble of the ancients, and ſometimes is but a thin film, a kind of enamel, ſhiver, or cruſt; but where it is in larger and more ſtony maſſes, it admits a high poliſh, is cut into various forms, and turned into vaſes [m].

Of the fibrous abeſtos I have a ſample found in a ſtone in the church yard of Landawinek, the filaments flat, pointed, of a bright purple colour, and ſilvery gloſs, extremely ſmall and flexile, appearing in the microſcope edged with a ſoft down, the fibres longer and of a brighter hue, but not ſo woolly as ſome ſamples I have from the iſle of Angleſea. In greater plenty I have received ſpecimens of

[h] Huelanboys.

[i] It ſeems the *Mica particulis ſquamoſis ſparſis* of Linnæus. Syſt. Nat. page 159.

* Linnæus Syſt. Nat. ib.

[k] From Gwenap.

[l] From Bellchapel work, in Gwenap.

[m] This ſhould be the *Ollaris ſolidus vireſcens, maculoſus polituram admittens* of Linnæus, page 160, N°. iii.

an

an aſbeſtos lately found in the pariſh of St. Clare, near the town of Liſkerd, by the Reverend Mr. Voſper, in the month of March 1756. It was firſt diſcovered about 150 yards, South-Weſt of the church, in an orchard belonging to the vicarage, but afterwards in ſeveral ſtones of the adjacent grounds; ſome of it of a light yellow, adheres to the outſide of a green hard ſandy killas, this is ſhort jointed, and not flexile, but it lies in veins generally, courſing in a wavy line [n] through the tender gritty cinereous killas before mentioned, page 92. The veins of N°. i. are of like colour to the mother ſtone, from the tenth of an inch to three inches wide; this is what is called by Authors [o] the whitiſh brown ſilky aſbeſtos, with long, continued flat filaments; it is not equally fine in all the ſtones wherein it appears; in ſome ſamples the aſbeſtos is very downy, and the filaments riſe flat and eaſily, from one inch to two inches and an half long. N°. ii. Is the amiantus *fibris mollibus parallelis facilé ſeparabilibus* of authors [p]. N°. iii. is in its exteriour like decayed willow wood; in other ſamples the fibres are three inches long, but more ſtony, rounder, more compact, and heavier, ſcarce at all plumous; this third ſort I take to be the *Amiantos fibris durioribus in lamellas craſſiores compactis ponderoſus* [q].

There is another ſort mentioned by Grew [r], called the "baſtard amiantus which grows in veins in a clay and mundick load between beds of a greeniſh earth in our Corniſh mines; the threads being one third or near half an inch long of a gloſſy black colour and brittle." Of the more downy ſorts of this ſtone, the ancients had the art of making a kind of cloth reſembling linen, it had this ſingular property that no fire would injure it, for which reaſon it was called *Linum incombuſtibile*, and the uſe of it was to ſhroud the dead bodies of princes, ſo as to preſerve their aſhes pure, and unmixed from thoſe of the funeral pile. Pliny lib. xix. chap. 1. ſays, that he had ſeen napkins made of this linen which after being uſed at table, were thrown into the fire, and thereby cleaned better than if they had been waſhed with water. The ancients made alſo nets of this ſtone, and reticulated caps for the head; it was alſo uſed as wicks for lamps, in which it proved ſo retentive of the fire, that Callimachus at Athens dedicated a golden lamp to Minerva, which continued burning, by means of the lint of this ſtone immerſed in oil, for a whole year without being extinguiſhed: Pauſanias in Atticis, chap. xxvi. A lamp of the ſame kind burnt in the temple of Jupiter Hammon [s]. It is to be obſerved however, that wicks for lamps made of the aſbeſtos do not yield ſo bright a flame

[n] See plate XXV. fig. xxx.
[o] See Hill's foſſils, page 102.
[p] See Linnæus Syſt. Nat. page 162.
[q] See Linnæus, page 163, ibidem.
[r] Muſæum of the Royal Society, page 313.
[s] Plutarch de def. Orac.

as thoſe of cotton. This ſtone was very rare among the ancients; Pliny [t] ſeems to think that it was only to be found in the burning deſerts of India, from the extremity of the heat in which climate it derived it's quality of reſiſting the force of fire. He ſays, (ibid) that it was ſo rare and precious, that the finding it was eſteemed a piece of good fortune, equal to the diſcovery of precious ſtones, and calls the linen wove of it ſuperior to any other in the world. Plutarch ſays it was found in Greece among the Caryſtian marble. It is now diſcovered in ſeveral parts of Europe, but whether ſo excellent as that of which the ancients made theſe curious linens it is hard to decide.

It may ſeem to ſome a little improbable that there ſhould ever have been an art of extracting cloth out of ſtone, but when we conſider the downy filaments of the aſbeſtos, and the extream fineneſs of its fibres, ſo apt to mix and entangle one with the other, and make a kind of tender wool, it will ſeem little more ſurprizing than that cloth ſhould be wove out of cotton. The art is ſuppoſed by ſome to have been loſt in the time of Pliny, for what reaſon I cannot ſay; for, by the paſſage above-mentioned, it is clear, that the cloths made of it were extant, and in uſe in his time. Plutarch alſo mentions them as made in his time; and at preſent the curious try experiments in the ſame way for their amuſement. "Septalius (ſays Grew, Muſæum, R.S. page 313,) hath, or lately had, ropes, paper, and netted-works, all made hereof, and ſome of them with his own hand." Whether the moderns underſtand the moſt efficacious manner of treating this ſtoney flax, is what cannot be determined; but their preſent manner of preparing it, is thus laid down by Pontoppidan, page 169, but from what authority is not mentioned: the ſtone is ſoftened in water, then beaten with a moderate force till the fibres ſeparate; afterwards carefully and repeatedly waſhed, till cleared of all terrene particles; then the flax is dried in a ſieve; the filaments are then ſpun carefully, the fingers being ſoftened with oil." The reaſon why the art is loſt, or rather diſuſed, ſeems not ſo much owing to the want of this ſtone, nor to the difficulty of weaving it, as to the little or no demand for it, burning the dead (which was the principal uſe of it) having never been an univerſal cuſtom in any even the moſt cultivated nations; and where it was a cuſtom, few were ſo curious as to prevent the mixing of the aſhes with thoſe of the funeral pile, and fewer ſtill were equal to the expence of procuring ſuch coſtly cloathings for the dead; but when the Chriſtian Religion prevailed over the Roman empire, and burning the dead was laid aſide, then, and not

[t] *Ibid. ut ſupra.*

before

before, this art ſeems to have expired of itſelf, becauſe the manufacture was of no longer uſe.

SECT. IX. Small gems of tin, and other ſtones.

Here, as fitter to be ranged among ſtones of curioſity, than to have a place among thoſe of uſe or profit, I cannot paſs by unnoted the beautiful gems which we find ſometimes among the tin grains, although they are ſo ſmall, that, to be viewed properly, they require the aſſiſtance of the microſcope; but they are not the leſs perfect, being as true gems, and of as high a luſtre, as thoſe that are larger.

N°. i. Among the tin grains found in Goſs-moor, in the pariſh of St. Columb, and thoſe found in St. Auſtel-moor, I have found topazes very high-coloured, and ſome of a paler yellow gold-colour, very tranſparent, ſome zoned, about the twentieth of an inch diameter.

N°. ii. Some rubies alſo I have found pebbly formed, ſome light, and ſome of as ſtrong red as a carbuncle.

N°. iii. Some of the ruby kind are mixed with yellow, and may therefore be ranged among the hyacinths.

N°. iv. A very ſmall chryſolite of a very dark-green with a tranſparency of yellow.

Coloured cryſtals.

N°. v. A very deep amethyſt, pebbly formed, of the fifteenth of an inch. We have alſo hexagonal cryſtals of the amethyſtine kind, tinged ſtrongly with purple, from our mines, ſometimes an inch and more long; but the fineſt luſtre of this kind which I have yet ſeen in the Corniſh ſtone, is incloſed in the body of the Polrudon ſtone[u], where the ſparks are the tenth of an inch long and under; but whether theſe are ſo hard as to deſerve the name of gems, I am not ſufficiently ſatisfied.

All theſe are ſo ſmall, that (it may be ſaid) they are of no value, which is very true; but my enquiries (unſucceſsful I own in many particulars) I ſhall not think entirely fruitleſs, if they can but point out the way to farther and more happy diſcoveries; theſe ſmall ſparks prove that ſuch gems are to be found among our tin-ores: it may not be unworthy therefore the attention of my countrymen carefully to inſpect the tin-grains of the ſmaller ſize found in ſtream-works, wherein they will probably find much larger than what I have here deſcribed, and ſuch as may well compenſate the labour of ſeeking.

N°. vi. One cryſtal I have coloured with the ſame brown and of as fine a luſtre as the Kerry ſtones of Ireland, but of a much deeper tinge, and, as I take it, of the Beryl-cryſtal kind[w].

[u] See before-mentioned page, 96.

[w] See Hill's Foſſils, page 178.

N°. vii. What

N°. vii. What we call Corniſh diamonds are figured cryſtals, and among cryſtals we ſhall treat of them; but ſome of our cryſtals are tinged with green: they are of the Emerald kind; what I have ſeen came moſtly from a copper-work in the pariſh of Camborn, called the Long-cloſe: the Oriental emerald is a moſt beautiful gem; for the occidental, the jewellers [x] uſually ſell this tinged cryſtal, common cryſtal being as hard as the occidental emerald; with us it is angular or columnar, but beſt when found in the pebble form, of which I have yet met none in Cornwall.

N°. viii. Some of our cryſtals are alſo of a ſea-green or beryll colour, and the ſame which authors call the Pſeudoberyllus: after burnt red-hot, they will retain their ſhining in the dark for a few minutes only, in this falling ſhort of the ſmaragdus which ſhines a conſiderable time [y], but, like that, change their green into a pale ſky-blue whilſt hot, but recover their native colour as they cool.

N°. ix. But of our curious green ſtones, none come near the colour and poliſh of a green cupreous incruſtation found in Huel-fortune, in the pariſh of Ludgvan. Its texture is ſtratous, cruſt within cruſt; its ſurface puculated; the tubercles which it forms on the ſtones, are ſometimes an inch in diameter, ſometimes ſmall, and either perfectly round or truly oval; the colour ſo deep a green, and ſo high a poliſh, that I have obliged ſeveral gentlemen with ſome to ſet in rings, for which nature has fitted them without the aid of a jeweller. This comes very near to the properties of the occidental turcois, and has been taken for ſuch by Naturaliſts. I have, from the ſame place, this copper of a blueiſh green clouded, but the green appears even there in ſome parts, and in the greateſt part of the ſpecimens, the green is predominant and unmixed. The blue-turcois is generally eſteemed a precious ſtone, but indeed no other than foſſil bone, or ivory ſaturated with copper diſſolved in an alkaline *menſtruum*; the green-turcois is the ſame ſubſtance intimately penetrated by a cupreous matter diſſolved in an acid *menſtruum*, but this precious ſtone from our Corniſh mines is the ærugo or a plain ſolution of copper, as appears by its forming itſelf into threads and ſtratous incruſtations [z]. I have met with none of this kind of any value but from this work, and it has been found there only in one ſmall cavity of about one foot and a half in diameter [a].

[x] Hill, 596.
[y] Dr. Grew's Muſ. R. S. page 287.
[z] "The turcois is much ſofter than cryſtal." Grew's Muſ. R. S. page 284.
[a] Fig. xiv. and xv. Plate XXI. have their tubercles of this beautiful green enamel.

CHAP.

CHAP. XI.

Of the general baſis of Stone, viz. *Of Spar, Cryſtal, and Diamond.*

THERE is a kind of ſtony lapidific matter which runs through and mixes more or leſs with the ſubſtance of all ſtones, and may juſtly be eſteemed the univerſal cement, by which earth and minerals are combined into all the ſeveral orders and ſpecies of ſtones, for when this cement is diſſipated by fire, or diſſolved by a *menſtruum*, the ſtone becomes earth or metal; and ceaſes to be ſtone: it is of itſelf tranſparent and colourleſs, but when mixed, is found either of that colour which the materials it joins together were of before they became ſtone, or of that which any after infection from other bodies has imparted.

This cement is either ſpar, cryſtal, or diamond. Theſe I ſhall not only treat of as being diſtinct ſtones, in figure, nature, and effect, but as one univerſal cement, running through and connecting all other ſtones in three degrees of purity and perfection. Thus for inſtance ſpar not only forms ſimple ſtones of its kind ſuch as the *Lapis ſpecularis*, double refracting and ſimple refracting ſpar, ſtalactites and the like, but is indeed the baſis of a great number of compound ſtones, from the tendereſt lithophytes to the hardeſt marbles. So again, cryſtal not only forms hexagonal columns, and cuſpides, pyramids, and the like, but is the gluten, the connecting baſis of ſlat, killas, granite, flint, porphyry, and the like; as diamond is alſo the baſe of gems. The ſtate of ſpar is the moſt impure, its parts are calcarious, lax, diſperſed, they ferment and give way to acids, are extracted, ſuſpended, and waſhed away by common water, conſequently the ſtones which it combines are ſoft, brittle, and eaſily diſſolved; this is the caſe of all ſtalactical productions, of alabaſter, free-ſtones, lime-ſtones, and moſt ſorts of marbles, of which the cement is ſpar. But the cement of ſpar is not always equally weak, ſometimes it will ſcarce ferment at all, gives fire with ſteel [b], and it approaches ſo near the ſtate of cryſtal, in hardneſs, tranſparency, and figure, that it is juſtly called cryſtalline ſpar.

Cryſtal has nothing calcarious in it, it's parts unite cloſe and firmly, and conſequently forms much harder ſtones than ſpar, with equal quantity of earth, ſand, or whatever the *charge* or materials in groſs may conſiſt of, and this is the caſe of porphyry, granite, jaſper, and other compound ſtones, (whoſe baſis is cryſtal) as well

[b] See the *Spatum compactum ſcintillans Linnæi Syſt. Nat.* gen. vi. page 167.

as pure cryſtals; and as ſpar approaches near to cryſtal, ſo does cryſtal oftentimes to the diamond, in hardneſs, luſtre, and reſiſting of fire. The diamond is the baſis of all gems, which in hardneſs and luſtre exceed the ſtate of cryſtal; the diamond is therefore but another remove, and in a more eminent degree the ſame ſtone and cement in the utmoſt perfection, (and therefore rare) which in inferiour ſtates of purity we call cryſtal and ſpar. To one of theſe three cements all ſtones whether ſimple or aggregate, may be ſaid to owe their connexion and ſolidity; a ſtone being nothing more than earth concreted by the intervention of cement, ſo as to acquire hardneſs and weight ſufficient to denominate it a ſtone [c].

If the ſtone will ferment with acids, ſoon diſſolve, be eaſily pulverized, gives no fire with ſteel, and ſhews other evident ſymptoms of ſpecifical ſoftneſs, it is then either wholly ſpar, or of a ſpar baſis; on the other hand, if it reſiſts acids, remains moderately firm under the hammer, and in a ſtrong fire, mixed with alcaline ſalt, will turn into glaſs, upon colliſion with ſteel gives fire, and in the hands of the engraver ſhews evident ſigns of a ſuperiour hardneſs, then it is either cryſtal or of a cryſtalline baſis [d].

Cryſtal is the ſofteſt of all perſpicuous gems, whatever exceeds it therefore in hardneſs is a gem, and if by a ſtill greater degree of purity than what is above-mentioned, the ſtone becomes ſpecifically heavier, and of better luſtre than any other meer ſtony bodies, and reſiſts fire almoſt to immutability, then it is called a diamond, and all gems, the ruby, ſapphir, and the reſt, are but this diamond, ſubſtance tinged and reduced, as to luſtre and hardneſs, by ſome metalline admixture.

SECT. II. Of ſpar.

In Cornwall all the white, opake, common, hard ſtone, is called Spar; erroneouſly it muſt be owned, for it is quartz, and not ſpar: but the Corniſh are not ſingular in this point; for if any thing could countenance errour, they have the authority of the greateſt lithologiſts in England (Mr. Lhuyd only excepted) of their ſide [e]. Indeed it muſt be acknowledged, that, till within theſe few years, the diſtinguiſhing characters of theſe two bodies have not been ſufficiently noticed in England; the late learned and ingenious Dr. Iſaac Lawſon was among the foremoſt of our countrymen who inſiſted upon their being treated always as really diſtinct and

[c] See page 80, note b.

[d] If it is not naturally figured and tranſparent, the Germans properly enough call it Quartz; that is, a coarſe, debaſed, opake, cryſtalline body, and not cryſtal. See page 91.

[e] It is juſtly objected to Dr. Woodward, that he has confounded ſpar and cryſtal in all his treatiſes, without noting the obvious differences abovementioned; and we may ſay the ſame of others, particularly of rhe learned Dr. Grew (ſee his Muſ. R. S. Part III. Chap. v.) though he had his acid *menſtruum* always before him.

different

I

II

III

a IV

V

VI

a VII

VIII

XIII

XV

XIV

XVI

IX

X

XI

XII

XVII

a b c d

XVIII

XIX

XX

XXI

XXII

XXIII

XXIV

XXV

XXVI

XXVII

XXVIII

XXIX

XXX

XXXI

XXXII

XXXIII

XXXIV

XXXV

To M.rs Grace Percival of PENDARVES in Cornwall, this variety of Cornish Crystals is with great respect inscrib'd by Wm: Borlase.

different ſtones [f]. That ſpar is ſuſpended in all waters is likely, but in particular waters is evident, from the incruſtations formed in water-pipes till in time they choak and can tranſmit no more; from petrified moſs, and many other phænomena. That ſpar is alſo to be found in ſea-water muſt certainly follow, from the ſea's being open to and ready to receive all that which ſprings will convey into it; from ſpars being evaporated by great degrees of heat [g], and therefore capable of being again precipitated by winds and rain [h]. Hence, from the ſolution I mean of ſpar in common water, come all petrifactions, and moſt of our ſtalactical concretions, marbles, and free-ſtones, which will ferment with acids, of all which the baſis is ſpar; hence alſo the new ſparry productions perpetually forming and formed in proper nidus's, by ſpar being eaſily ſolved and diſperſed, and as apt to coaleſce again into ſtone upon the deſertion of the water in which it is ſuſpended. However, theſe ſparry productions are not common with us, and ſpar by itſelf, tranſparent and unmixed, is very rarely found in this county.

SECT. III. Cornish cryſtal.

Our cryſtals are in great plenty and variety: I ſhall conſider them either as plain or figured; for, even in the plain, there are ſome varieties not unworthy our notice. By plain, (that is quartz [i]) I mean a maſs of cryſtal which covets no particular form, but hardens into that figure to which the gravitation of its own parts, and the medium in which it forms determines it. Of this ſort is that which fills the veins and interſtices of the ſtony *ſtrata*, and the white angular maſſes of ſingle-diſperſed ſtones common every where in Cornwall [k]. Of this ſort alſo are the wavy proceſſes of cryſtal, which, like ſo many flakes of ice, incruſt the perpendicular ſides of our karns of granites, Plate XIII. Fig. 1. Of the plain ſort are all cryſtal horizontal incruſtations which coat-over ſtones, and hang in threads as they deſcend, reaching croſs the hollows from one tubercle to another [l]. Of this ſort alſo may be reckoned all cryſtals of the bliſtered and mammillary kind, which end in one drop, and have their ſides preſſed into orbicular puſtules by the weight of ſucceeding drops, as Plate XIII. Fig. 11. Of the plain kind alſo are all cryſtal ſtalactites, of which I have ſome ſo perfect, which I received from a work, called the Pool, in the pariſh of Illogan, exhibited Plate XIII. Fig[s]. 111. and 1V. that the

[f] "*Hoc fruſtulum & alterum ſpati addidi quoniam hæc duo foſſilia [ſcil. ſpatum & quartzum] figurâ naturâ et effectu adeo diſtincta animadverto hic in Anglia nullo modo diſcriminari.*" *If. Lawſon, M. D. ad auctorem, A. D.* 1740.

[g] Hill's Foſſ. page 156.

[h] See Woodward's Cat. vol. I. page 113, 116.

[i] Quartz differs only from cryſtal, as before-mentioned, in that it is not figured: it is radically the ſame ſtone; and therefore quartz is cryſtal, plain, not angularly figured; but yet has ſeveral varieties. "*Lapides cryſtalli dicti a quartzo et ſpato ſolum figura differunt.*" Lin. Syſt. Nat. p. 224.

[k] See before, page 48.

[l] Philoſophical Tranſactions, on the Corniſh diamonds, by the author. A. D. 1750.

formation

formation of them in the ſtalactical manner can admit of no diſpute. They are of the colour of fine glew, tranſparent as gum-arabic, and to the eye of like texture; they end in one drop as round as any drop of dew or rain whilſt it hangs ready to fall. It breaks like flint into irregular, edgy ſplinters. In Fig. IV. one of the ſtalactical productions, *a*, *a*, was evidently wreathed and twiſted from the uſual perpendicularity, by ſome force (in the mine) either of fire, wind, or water. This muſt have happened whilſt as yet it remained in its liqueſcent tender ſtate; but the liquid was ſo ſtiff and clammy, that though the three pendant proceſſes were connected by this force, yet the circumference of each proceſs, its annular tumours, and the terming drop of each ſtalactite, is plainly to be diſcerned. Among the plain-cryſtals I ſhall alſo reckon the pebble-cryſtal [m]; for this ſeems to owe its orbicular figure to nothing more than what is common to all bodies, I mean, the gravitation and mutual attraction of ſimilar parts aſſiſted or controuled by the medium in which theſe round maſſes formed. Cryſtal, in all theſe circumſtances, has no uniformity of figure, gives no evidence of any inherent active principle, but ſuffers itſelf to be faſhioned and molded by its own gravitation, by the *nidus* it reſts in, or by the medium which ſurrounds it, and yet is perfect cryſtal, breaks irregularly, gives fire plentifully with ſteel, is very hard to the graver, and ferments not in the leaſt with *aqua fortis*.

SECT. IV. Figured cryſtals.

But though the Corniſh cryſtals in theſe inſtances are paſſive, and covet no particular figure, yet, in a great variety of inſtances, they are figured either uniformly, or with ſome accidental differences.

Cryſtals are moſt generally found in the hexagonal form, and in theſe three different ſtates; either pyramidal, as Fig. IX. Plate XIII. their ſix ſides tending to a point; or columnar, the ſhaft capped with a pyramid, Fig. X. ib.; or columnar with a pyramid at each end, as Fig. XI. ib. (page 119); making in all eighteen ſides or planes.

The ſides of the ſame maſs are ſeldom of an equal breadth and length, ſome ſides being more than three times as wide as others, as in Fig. VIII. and XV. ib. neither do they always end in a ſharp point; ſometimes the point is ſhortend and notched, as in Fig. XIII. ib. each plane of the *cuſpis* making a diſtinct angle.

Sometimes the point ends in a ſharp edge, as Fig. XII. XIV. VXII.

The pyramidal *cuſpis* is not always hexagonal, but ſometimes tetragonal, conſiſting of four equal planes, as Fig. XII. ending in

[m] Before page, 104.

an

edge, underneath which there is a tendency towards forming another equal pyramid; a tendency compleated in Fig. XIV. where the pyramids are nearly equal, on one ſquare baſe common to both.

The cryſtal, Fig. XVI. ſhoots in a triangular form, like a wedge.

Fig. XVII. is tabular, the planes pentagonal, the ſides quadrangular.

Fig. XVIII. is a ſhaft on a rhombic baſe.

Fig. XIX. conſiſts of a pentagonal ſhaft; it is pointed, but very obtuſely, at each end, the cuſpides being compreſſed almoſt into one hexagonal plane. It breaks into rhomboids.

Fig. XX. is the plan of the baſe of an hexagonal flattiſh piece of cryſtal Fig. XXI, whoſe ſides are alternately wide and narrow at its top and bottom. Theſe figured cryſtals, N°. VIII. and from XII. to N°. XX. are all from the Long-cloſe copper-work in Camborn, and being heated gradually (for if violently ſcorched they will fly) by applying a hot poker, or rather placing them in a crucible over a gentle fire, will throw forth a lambent flame of the rainbow colours, like a native phoſphorus.

Fig. XXII. exhibits a polyhedron of cryſtal.

Fig. XXIII. is the plan of the circular baſe of two cylindrical columns, Fig. XXIV. of ſhotten cryſtal, the only one of that form which I have ſeen.

Fig. XXV. is the baſe of the *fruſtum* of a cone; the exteriour ring of cuſpides is bright amber; the next plain opake white; the third radiated, the rays tending from the centre; the next opake white, till you come to the central *nucleus* which is an irregular ſpeck of the yellow copper ore; Fig. XXVI. is the elevation of this *fruſtum* [n].

Fig. XXVII. exhibits a piece of hexagonal cryſtal of the fineſt water, incloſing green ſprigs ſeemingly of moſs. This happens ſometimes to cryſtal, and doubtleſs to our Corniſh cryſtals as well as others [o]. "A piece of cryſtal (ſays Dr. Grew, Muſ. R. S. Part III. Chap. iv.) in which is immerſed a moſſy ſubſtance of a reddiſh colour, and there are ſome cryſtals have been known naturally to incloſe a liquor."

Fig. XXVIII. is a cluſter of ſemipellucid cryſtal ſhot into reclined cones, which make an angle of near forty degrees with the ſurface of the ſtone. The ſides of theſe cones are very curious fret-work of little ſpires or briſtles, many of them ſharp as the ſmalleſt needle, and pointing nearly in the ſame direction as the cone on which they riſe. The ſurface of theſe ſhoots is of a ferruginous flint-like ſubſtance, but the inſide more clear and tranſpa-

[n] Mr. Lhuyd has a ſpecimen of like ſhape, but of a ſparry baſis, which he calls Fluor triquetrus, N°. XXXIV. Table I. of his Lithophylacium.

[o] This ſpecimen was not found in Cornwall, but is introduced to ſhew that cryſtals incloſe, and therefore have been formed ſince plants.

rent. It has this farther peculiarity that its ſhoots tend all one way, whereas, in other cryſtal lumps, they point differently according to the beds they riſe from: the only one of this kind I have yet ſeen. It came from Trevaſcus mine, in the pariſh of Gwynier.

Fig. xxix. is an aſteriſk of the cleareſt cryſtal; its rays hexagonal, ſwelling or gibbous in the middle; their ſides not rectilinear, but ridged near the edges, and ſomewhat hollow, but not uniformly ſo, betwixt the ridges. The extremities are entire, ending in one ſharp point; and it is very plain that they never had any pyramidal apices: the rays near the baſe ſpread horizontally, but the others raiſe themſelves, gradually making a greater angle till the middle and higheſt make nearly a right angle with the baſe. I have ſeen one more of this kind, but not ſo entire as this curious ſpecimen *.

Fig. xxxiv. a triangular pyramid, the ſides conſiſting of triangles equal to one another, and to the baſe.

Fig. xxxv. a triangular cunoeid jointed cryſtal, the baſe of the one alternately contiguous to the apex of the next adjoining.

Theſe are the principal varieties of cryſtal which a collection of ſome years from our Corniſh mines has afforded, and I doubt not but new diſtinctions and different forms, and very likely more elegant ſpecimens, will occur to gentlemen who will induſtriouſly collect, compare, and ſet in order, the cryſtals of different mines. Of this the curious Mrs. Grace Percival of Pendarves (to whom this collection is indebted in more than one inſtance) has offered us a fair pattern, by fixing ſide by ſide in her Foſſillary an infinite number of cryſtals of various and the cleareſt waters, in all ſhapes, ſingle and in cluſters, moſtly out of mines in her own lands, all out of her neighbourhood. So many rich ſubjects will well remunerate the attentive inſpection of every inquiſitive Foſſiliſt at her ſeat of Pendarves, in the Pariſh of Camborn, Plate the XIV.

SECT. V. Their ſize.

The figures in Plate XIII. are all of the natural ſize, but the bodies deſcribed are not always of the largeſt kind. The largeſt hexagonal cryſtal which I have yet ſeen found in Cornwall, is ten inches and a half in girt near the baſe, and ſeven inches and three eighths high. It weighs three pounds and half an ounce. From this ſize we have theſe cryſtals of all dimenſions down to that of a ſmall pin.

SECT. VI. Tranſparency and colour

They are ſometimes of a fine clear water, and are therefore commonly called Corniſh diamonds, and of all our baſtard diamonds in this nation are eſteemed the beſt [P]; but they are not all colourleſs,

* The intermediate numbers are explained in the following pages.

[P] "Of our baſtard diamonds here in England the Corniſh are the beſt, much better than thoſe on St. Vincent's rock near Briſtol." Grew's Muſ. R. S. Part III. Chap. iv.

ſome

To Samuel Percival Esqr. this Western View of PENDARVES House in the parish of Camborn Cornwall engravd at his expence is most gratefully inscribd by

Wm Borlase.

ſome are yellow, brown, cloudy, opake white, green, purple, black, ſome freckled with little ſpecks of various colours and magnitudes, every cryſtal being either pure and pellucid, or receiving its tinge from the mineral juices and earths adjacent. Theſe ſtones, it is obſervable, are generally more clear and tranſparent at the point than at the root. I have had two ſamples of cryſtalline *cuſpides* entirely black, and have ſeen no more, they being very rare. This ſort is taken notice of by Linnæus Syſt. Nat. page 167, and is, I think, his *Nitrum quartzoſum nigrum*, or Morion [q].

SECT. VII. Weight.

The more clear they are, the heavier; of which the reaſon ſeems to be, that in clear ones there is more ſtone in any given quantity, than in opake ones, which latter conſiſting of earthy and mineral impurities mixed with the ſtony, muſt therefore under any equal ſurface include leſs ſtone than the purer ones, and this obſervation is confirmed by the ſuperior weight of the true diamond to that of other ſtones. The weight of our Corniſh diamonds to water, I find at a medium, as ten and a half is to four.

SECT. VIII. Hardneſs.

The ſame reaſon that makes the pure more heavy than thoſe which are otherwiſe, makes them alſo harder; the more ſtony ſimilar matter there is, the cloſer is the connexion of parts; whereas the coheſion is greatly weakened, and the body becomes more friable by means of the earthy parts which intrude themſelves among the ſtony; the clearer therefore our Corniſh cryſtals are, the better their points will cut glaſs (though not ſo free, or ſo deep as the true diamonds) and the better they will bear engraving for ſeals.

SECT. IX. Texture.

The texture of theſe figur'd cryſtals is various; ſome are of an uniform texture, of one colour and conſiſtence throughout: this was the caſe of Fig. v. vi. xxiv. and many others here exhibited. Some ſpring as from a center, or one common line, as Fig. v. vi. vii. xxxiii; ſome have hexagonal ſheaths deſcribed one within another, as Fig. xxx. a very remarkable ſtructure, and not eaſily accounted for; ſome learned men imagine that they are different incruſtations, applied ſucceſſively at different times, one without the other, and ſuch indeed at firſt ſight they ſeem to be, but if we recur to the original formation of theſe bodies (as in order to diſcover truth we muſt) it will be very difficult, not to ſay impoſſible, for us to conceive any poſition or direction in which the middlemoſt ſhaft could lie, ſo as that three incruſtations of ſuch an equal thickneſs ſhould form round it, neither will the laws of gravitation and

[q] Vide Morion.

projection

projection permit that any juice ſhould cryſtallize in ſuch thin, equal, and continued plates as form theſe ſheaths: it is an opinion attended with much fewer difficulties to think that they all hardened nearly at one time, and that the whole ſhoot when uniform was produc'd at one effort, but where the ſtructure varies, by ſome ſuccedaneous, direct, or undulating efforts in point of time following cloſe upon one another; that in the latter caſe the juices of which the maſs conſiſted, gave way to the efforts in proportion as their different mixtures made them more or leſs ſuſceptible of the motion impreſſed, the moſt agile and pureſt ſtone flying off to the greateſt diſtance from the center, and the coarſeſt and moſt opake remaining neareſt to the center; and to this latter opinion I the more willingly adhere, becauſe (as I hinted before) theſe ſtones are generally more clear at the point than at the root, and becauſe in many orbicular lumps of cryſtal, particularly Fig. VII. I find all the middle of the lump (*a*, *b*, *c*,) opake, terrene, and cloudy, the ſheath next the middle faint and duſky white, the next ſheath faint purple; the third a brighter white than the firſt, the next a wider ſeam of purple, but its tinge fainter; the fifth a more diſtinct white, the next a tranſparent liſt of cryſtal in which the purple tinge was ſcarce diſcernable; the laſt and outmoſt of all, the pureſt cryſtal. In this ſpecimen it is very obſervable that the white and the purple are alternately fixed in parallel angular fillets, the cryſtal gradually forſakes the purple tinge as it advances to the extremity, and the white increaſes its purity in three degrees till it ends in a fourth of the cleareſt cryſtal, confirming (as I ſhould think) what has been hinted before, that the purer the cryſtal, the farther it proceeds from the center, whilſt the more impure and ſluggiſh parts of the maſs reſt ſtubborn and unmoved in the center of all. The texture of Fig. XXV. eſtabliſhes the ſame truth; at the firſt effort, the pureſt cryſtal fled off and coated the circumference with hexagonal cuſpides; a fainter effort ſucceeded, whereby the purer parts of the remaining cryſtal were protruded ſo from the center as to form a circle of ſubdiaphanous rays in the opake white.

SECT. X. Their figure.

The variety of figures in which theſe bodies are found has been already mentioned, and the cauſe to which theſe figures are owing muſt now be taken ſome notice of. That theſe ſtones have been in a fluid ſtate, and thence paſſed into their preſent ſolidity, muſt evidently appear, by obſerving, that the four firſt figures, Plate XIII. page 119, are of the ſtalactical kind; that Fig. V, VI, VII, XXIII, XXIX, XXXIII, plainly indicate their having ſhot forth as from a center, protruding themſelves every way till they terminate in a point;

point; that Fig. XXVII is of the cleareſt cryſtal incloſing ſomething of the moſs kind, which could never happen but when the cryſtal was in a fluid ſtate. Fig. XXXI is a groupe of hexagonal cryſtals pointed at each end, and immerſed in the ſubſtance of one another, in ſuch a manner as could not have happened but when ſome or all of them were in a ſtate of fluidity, the hardeſt making their way into the ſofteſt, and the ſofteſt cloſely cohering to the hardeſt, ſo as that they both conſolidated into one lump. All theſe facts are plain from the inſpection of the bodies before us, and there is not the leaſt occaſion to have recourſe (as ſome moderns have done) to any operoſe chemical analyſis to prove, that cryſtal has been fluid, and therefore may be ſo again. Another conſequence is alſo plain, *viz.* that, during this ſtate of fluidity, they received the ſeveral figures in which we now find them; but to what cauſe this variety of figures is owing, muſt be the next enquiry, and is very difficult to be ſatisfied. That ſtone, quatenus ſtone, has not the faculty of producing theſe configurations, is a truth ſufficiently confirmed, one would think, from the vaſt *ſtrata* of quarries, cliffs, and fiſſures of ſtone in which there is no regular rectilinear form: the ſhootings of ſtone into figure are ſmall in compariſon, few, and rare, owing to accident and mixture, not the eſſential products of the *ſtrata*. All ſmall quantities of lapideous matter would probably form themſelves by the mutual attraction of ſimilar parts, and the equal preſſure of ſurrounding fluids into globular maſſes, as water, oil, quickſilver, and liquid bodies do, were it not for ſomething which intermixes with the ſtony matter, and prevents this ſimple figure from taking place. The cryſtal which appears in the ſtalactical form, has nothing in it which tends to configuration, more than any common ſhapeleſs marble, ſpar, or killas, and may convince us that meer cryſtal covets no particular figure. Cryſtal in this ſtate wants that active principle which throws the ſame ſtone at other times into a great variety of ſhapes; what that principle is, the learned do not agree; but clear it is, that it is ſomething adventitious and different from cryſtal. It has been imagined, that the angularly-figured cryſtals owe their ſhape to the different metals which they encounter during their fluidity; but this is ſeldom the caſe *, for cryſtals, which are of four, five, or, what is ſtill more common ſix angles, are oftentimes extreamly clear, and have no appearance of any metal in them, neither do they yield any metal upon trial by fire that ever I could learn. "Pure cryſtal, and without mixture of other matter, ſays Dr. Woodward [r], concretes ever into an hexagonal figure, pyramidal or columnar, terminating in an apex:" but we

* See page 127.

[r] Cat. vol. I. page 220.

have as pure cryſtals of the tabular kind; we have quadrangular columns, and triangular pyramids, as pure, to all appearance, as any of the hexagonal kind whatſoever; the cauſe therefore of the hexagonal figure muſt be ſomewhat diſtinct from pure cryſtal, ſince we find that pure cryſtal can ſubſiſt without it, and is found as tranſparent, hard, and immoveable to acids in other figures as in that. It muſt be alſo diſtinct from the cauſe of other figures; for the ſame principle which forms bodies into an hexagonal maſs, cannot be that which in other places give the trigonal or rhomboidal ſhape to bodies of like ſubſtance. It is true, cryſtals are oftener found hexagonal than in any other figure; but this can prove only, that the cauſe of this figure is more abundant than that which occaſions the other figures; it will not prove, that it is inſeparable from pure cryſtal. Salt is the moſt active principle of the foſſil kingdom, every where diſperſed, ever buſy, when fluid and at liberty, in producing multangular figures, according to the ſeveral powers with which nature has inveſted particular ſalts [s]; and it muſt be obſerved, that there is hardly any figure in the cryſtalline claſs but may be found in the analyſis of ſome ſalt or other. Thus, for inſtance, in nitre (a ſalt diſperſed in earth and ſtone, in air and water, in plant and animal,) we find the exact repreſentations of hexagonal cryſtals in their different ſtates [t], now with one pyramidal apex, as Plate XIII. Fig. X. now with two, as Fig. XI. ſometimes with equal correſpondent ſides, as Fig. X. ſometimes with unequal, as Fig. VIII. "ſome cut ſloping at the ends down to a ſharp edge, in the manner of a chiſſel," (ib. page 62) as Fig. XIX. but always hexangular. In *ſal gemmæ*, and ſea-ſalt, we find the quadrangular pyramid, with the truncated ends, (ib. page 57) as Fig. XII. In the cryſtals of alum we have the polygon, Fig. XXII. as well as in the ſalts of lavendar and thiſtle, (ib. page 180). Among the cryſtals of diſtilled verdigreaſe, (N°. VII. ib. Plate II. page 96) we have the columnar rhomboidal ſhoot, Fig. XVIII. In the ſalts of tin (page 128, ib.) we have the two pyramids applied baſe to baſe, as Fig. XIV. In Cheltenham ſalts (ib. page 154, Plate V.) we have the exact afteriſk, as Fig. XXIX. The ſalt of Camomel has Fig. XX. (ib. page 166), and the parallel liſts of Fig. XXX. may be ſeen there and in the ſalts of fennel, (page 172), and in the ſalt of thiſtle, (page ib. 180.) The ſalt of the Jeſuit's bark is full of rhomboides. In the *ſal gemmæ* (letter *e*, ib. pa. 74) is that lump of pyramidal cunoeids placed laterally as in the cryſtal, Fig. XXXV. The pentagonal tabulated cryſtal is found alſo in the ſalts of camo-

[s] This has made ſome Naturaliſts advance that omnis cryſtallizatio eſt a ſale. "Salia cryſtallizationis omnis unica cauſa." Linnæus Syſt. Nat. page 224.

[t] See employment for the microſcope, by Henry Baker, Eſq; F. R. S. vol. II. page 65.

mel,

mel, (ib. page 166.) The zig-zag angular fillets of Fig. VII. are found in Cheltenham ſalts, (page 154, ib.) In the ſalt of antimony we find the conick ſpires of Fig. XXVIII. and in general it may be affirmed, that there is ſcarce a figure among the cryſtals but may be traced among the ſalts analyzed; here therefore I would obſerve, that all the influence which metals have upon the ſhape of cryſtals, is probably owing to the ſalts of thoſe metals; for it is obſervable in the ſalts procured from tin (as exhibited by Mr. Baker, ib. Plate IV. page 128) that they are exactly of the ſame polygonal ſhape as the real ſtony cryſtals, including this metal which in Cornwall we call Tin-grains[u]. Again: Let it not paſs unnoted, that cryſtals in ſeveral ſpecimens have all the indications neceſſary to ſhew that they were protruded, ſometimes from one common intermediate line, as Fig. V. VI. ſometimes from a point, like rays from a center, as Fig[s]. XXIII. XXV. XXIX. and XXXIII. herein alſo imitating the agility of cryſtallizing ſalts, which ſhoot and extend their rays viſibly in like manner; and foraſmuch as here are proofs of the ſame procedure of figured bodies from an unfigured maſs, and of the ſame figures produced by that proceſs, it ſeems but reaſonable to conclude, notwithſtanding the objections of ſome moderns, that the figures of cryſtals are owing to the adventitious ſalts which prevail in the cryſtalline matter.

SECT. XI.

The pointing or direction of the Corniſh cryſtals in the mine.

As cryſtals, eſpecially thoſe of the hexagonal kind, are frequently found in cluſters with one end fixed in a bed of coarſer cryſtal than the ſhoots, and that bed broke off from a larger maſs of ſtill coarſer materials, I went not many years ſince into a mine[w] on purpoſe to obſerve theſe cryſtal productions in their natural ſite.

The cavity to which we were introduced, was not much larger than a common baker's oven, and much of that figure, about five feet high from the floor. The roof was the moſt ſurprizing piece of fret-work imaginable, conſiſting of hexagonal cryſtals pointing forth in every direction very plentifully[x] of ſeveral ſizes, ſometimes projecting in groupes and cluſters from large protuberances in the cieling, ſometimes ſingle, now croſſing each other, now ſtanding by each other with parallel ſides; the fineſt were thoſe which had innumerable little diamonds or ſparks of the cleareſt water beſprinkled upon their ſides: I obſerved that their pointing was uſually according and nearly perpendicular to the planes from which they proceeded; from which I conclude, that as the plane, the ſhape, and turn of the

[u] See Plate XX. of the figured-tins.

[w] Pillion-erth, in the pariſh of St. Juſt.

[x] In Norway hexagonal cryſtals, "are called Mountain Drops, and known from experience (ſays Biſhop Pontoppidan, page Eng. 170) to be generated in a chalky porous ſtone, in ſhape like a drop-ſtone;" but if this was their original, ſuch bodies could only point to the center of the earth, as all ſtalactites muſt by gravitation of their parts; but the reverſe is true.

lapidific

lapidific matter (when drained of ſuperfluous moiſture, and diſpoſed to ſhoot) happens to be, ſo will the tendency of the ſhoots, both column and point, be: in all concave beds, for inſtance, the points will converge; in all convex ones, they will turn the contrary way: if the concave part, for example, of the ammonites, Fig. XXXII[y]. be ſet with cryſtals, their points will tend inwards towards the centre, being thereto compelled by the regular contour of the *cornu-ammonis*; but if the cryſtal riſes from a convex bed, or orbicular lump, then will the columns ſpring as from one common centre, and point forth their *radii*, as in Fig. XXXIII. Pl. XIII. p. 119. If there be a thin plate of cryſtal, equally expoſed to the influence of heat or cold on each ſide, with equal room and force to ſhoot, it will throw forth its points on each ſurface, and the line, from which the fibres began to ſpring, ſhall be exactly in the middle of ſuch plate of cryſtal, as Fig. v. Fig. VI, ib, is alſo eaſily to be accounted for on the ſame principles: it is the ſection of an oval lump of cryſtal, equally impregnated with ſalt; it muſt therefore ſhoot as from a line or commiſſure in the middle; for the contiguous columns, being protruded on every ſide with equal force, muſt be of equal length; if the lump had been globular, theſe rude columns would have ſhot as from a center, as in Fig[s]. XXIII. and XXV. ib. the fibres do. Hence I conclude, that the direction of columnar cryſtals is nearly rectangular to the plane of the bed from which they iſſue, and that all the ſeeming confuſion in the pointings of theſe bodies in the mine above-mentioned was owing to the great variety of ſurfaces and angles into which that large body of cryſtal was hardening when theſe hexagonal cryſtals ſhot from its extremities.

CHAP. XII.

Of Semimetals found in Cornwall.

FROM ſtones of ornament and curioſity come we next to the products of the mines and ſtones of profit, few countries, according to the judgment of foreigners, exceeding this county in the variety and plenty of minerals[z]: but we have rather the poſſeſſion than the enjoyment of this treaſure; for though this multitude and variety appears every where in thoſe parts moſt ſubject to mines (I mean from St. Auſtel weſtwards), yet few of our people

[y] From Mr. Allen's quarries at Bath, none of that ſort being yet diſcovered in Cornwall.

[z] Beecherus refert de Cornubia in dedicatione alphabeti ſui mineralis ſe credere nullum terrarum locum reperiri qui minerarum multitudine et varietate antecellat.

(engroſſed

(engroſſed as they are by tin and copper) are either delighted with or even ſenſible of the one, or at all the richer for the other.

Of biſmuth, ſpeltre, zink, naptha, antimony, *lapis* calaminaris, and molybdæna, I have received ſpecimens from ſeveral parts of Cornwall: they are juſt enough to whet the appetite of the curious, but hitherto not enough to awake the induſtry or fix the attention of the owners.

We call biſmuth tin-glaſs, and ſeveral bits at ſeveral times, pure as if in a metallic ſtate, I have received from the pariſh of St. Juſt, but, put all together, they will ſcarce make a pound weight: it is more plenty, though more diſperſed, in Mr. Beauchamp's cobalt mine, in the pariſh of Gwenap. Biſmuth.

Speltre ore I have had from a mine near St. Columb, and Dr. Woodward, Cat. vol. II. page 83, mentions ſome from St. Merwin near Padſtow. One ſemimetallic ſpecimen, which I have from Camborn, of a brown, cinereous colour, very cloſe-grained, ponderous, and of uniform ſtructure, has been taken for zink [a]. Speltre.

Of Naptha I have ſeen but one ſpecimen, which came from Tolgaric work, in the pariſh of Camborn. Naptha.

SECT. II.

Antimony.

In the pariſh of Endelian there are ſeveral veins of antimony mixed with ſmall ſpots of copper and ſome lead, there called Roſ-carrock's [b] (as Grew ſays, Muſæum R. S. page 334): theſe veins run ſometimes north and ſouth, but oftener eaſt and weſt: the north and ſouth veins are the biggeſt; and when the eaſt and weſt veins join, or croſs the former, they commonly make a bunch of ore from one foot to two feet wide, all of ſolid antimony. Some antimony is now raiſed in the lands of the Reverend Mr. Hearle, in St. Minver, a pariſh adjoining to the former. Antimony has alſo been found in St. Auſtel pariſh, in St. Stephen's at Howton, and in a place called by Dr. Woodward (Cat. vol. I. page 184) Barbary-work; in St. Kew pariſh alſo, as the ſame author (Cat. vol. II. p. 20) informs us, and, I doubt not, is thrown away as uſeleſs in a greater number of places; but there are no workings on this mineral in the county at preſent, conſiderable enough to be more particularly mentioned. It need only be obſerved, that antimony is reckoned to be of an intermediate nature betwixt gold and ſilver, and by the texture, and weight of its ore, ſo likely to contain metal, that the late famous Dr. Boerhave tried for a whole year to extract from it a real metal, but without ſucceſs [c].

[a] By Mr. Ornſkold, a learned Swede.

[b] From a Manor of ancient note there, I ſuppoſe, more abounding in antimony than the reſt of that neighbourhood. See the Map annexed.

[c] Theor. Chem. page 13.

SECT. III. Magnaneſe.

Manganeſe, a ferrugineous mineral, uſed to attemper and bring glaſs to its proper luſtre [d], has been lately diſcovered near Tregoſs moor, in the pariſh of St. Columb; the load is twenty feet wide, and ſo near the ſurface that one ton may be raiſed for one ſhilling and ſix-pence; there is ſome iron in it, and a great deal of the coarſe *lapis hæmatites:* but there muſt be ſomething much more valuable than iron; for, in the year 1754, a ton of this ore was ſent to Liverpool, and thence to Boſlam, forty miles diſtant, and was there ſold for five pounds eight ſhillings and ſix-pence [e]: but though many tons have been raiſed, the adventurers meet with very little demand for it; one, among many proofs of the want of intercourſe and correſpondence betwixt Cornwall and the proper markets for minerals. Dr. Woodward, Cat. vol. I. page 30, mentions a conſiderable quantity of manganeſe, diſcovered about three miles from Penzance.

In the year 1750, in a mine near the town of Penryn, were diſcovered ſeveral bunches of load-ſtone; having tried and armed ſome pieces of them, I found their magnetiſm not ſtrong, and the preſent perfection of artificial magnets renders the labour of ſearching further after natural ones entirely needleſs.

SECT. IV. Molybdæna, or the pencil lead.

I have one ſpecimen only of molybdæna; the ſtone to which it adheres is very like the more gritty kind of *lapis* calaminaris, which ſometimes contains lead: ſome ſmall gravels of this will mark paper as free as the molybdæna from Cumberland; the gravels are about a third of an inch in bigneſs. They came from a work in Camborn, called Huelcrafty, whereabouts very likely there may be more of this very ſcarce foſſil to be found.

SECT. V. Cobalt.

In the year 1754 the ſociety at London, for encouraging arts and uſeful diſcoveries, thought proper to offer a præmium of thirty pounds for the beſt cobalt diſcovered in England; and a diſcovery of this kind being made in the lands of Francis Beauchamp, Eſq; in Gwenap, the mineral found was ſent to London in December 1754, and honoured accordingly with the præmium; and as the different arſenicks, as well as zaffer and ſmalt, (of great uſe for ſtaining glaſs blue, and painting in oil-colours) are procured from Cobalt, and hitherto imported at a great price from foreign countries, it is wiſhed that this diſcovery may be compleated, and, by keeping our money at home, be of uſe to the nation in general, as well as profit to Cornwall in particular. At preſent the Corniſh

[d] Cramer's Theor. page 201.

[e] Iron is delivered at the iron-works from the foreſt of Dean uſually at the price of twelve ſhillings and ſix-pence per ton.

are

are entirely to ſeek for the method of aſſaying, and even diſtinguiſhing critically the cobalt from its various mixtures in the mine; and till the cobalt is carefully ſelected, it will probably be of little value. In the ſame load there is a good deal of Biſmuth, not only where the cobalt is, but ſo prevailing in other parts of the mine, that it may as juſtly be called a mine of biſmuth as of cobalt [f]; and biſmuth being of great uſe for hardening and perfecting pewter, &c. and many thouſand pounds ſent out of the kingdom yearly for it, this mine will, it is hoped, prove as valuable for its biſmuth as its cobalt, under proper direction.

Native rock-ſalt, or ſalt from ſprings, or pit-coal, I have never yet heard of found in Cornwall: theſe ſeem to be the portion of other parts of England; ſome countries are favoured with one thing under the ſoil, ſome with another, and Cornwall has little reaſon to complain of her allotment.

Dr. Woodward [g] mentions a ſulphur-ore from Redruth, and native ſulphur in a maſs of antimony from a mine in St. Kew pariſh [h]. This is the yellow matter that covers and interlaces the veins of antimony in the pariſh of Endelian: at the mine it is unctuous, and burns freely with a blue flame [i].

SECT. VI. Of Mundic,

But of all our foſſils, which are mineral only, (as far as is yet diſcovered) and not metallic, that which we call Mundic offers itſelf in greateſt plenty, every where almoſt intermixed with tin, lead, and copper, but ſometimes found making a lode or vein by itſelf without any metal near it.

This is ſometimes called a Pyrites, but better known among Naturaliſts by the name of Marcaſite [k], a name proper enough for any foſſil, which, for ought we know at preſent, has only the appearance, mark, or outward teſtimonies of metal, ſuch as weight and colour, but oftentimes uſed as well to expreſs a foſſil any-ways remarkable for the regular figuration of parts, or glitter of its ſurface. The Corniſh name is Mundic, from the cleanly ſhining appearance both of its ſurface and ſtructure, and to this name I ſhall confine myſelf.

SECT. VII. Colour, and texture.

This ſemimetal is variouſly coloured on the outſide with blue, green, purple, gold, ſilver, braſs, and copper-colours; but, examining it at the fracture, I find only three diſtinct colourings, which

[f] The biſmuth was quite thrown away till the learned and ſagacious Dr. J. Albert Schloſſer, F. R. S. came to view it September 8, 1755, who extracted the cobalt tint for glaſs and ſmalt, and at the ſame time ſeparated and preſerved the Biſmuth.

[g] Vol. II. Cat. page 17.

[h] Ib. page 20, g, 3.

[i] Ib. g, 12.

[k] Italicè Marcaſita a verbo marcare, to ſtamp or mark any thing.

I diſtinguiſh

I diſtinguiſh, firſt, into the ſilver or plate mundic; ſecondly, the braſs or *pyrites aureus* of Grew; and, thirdly, the brown colour: the other colours are no more than a thin film or ſediment, which water, either from its own impregnation, or the nature of the foſſil it reſts upon, depoſites upon the ſurface.

The texture of mundic is either fibrous and radiated as in pyrite nodules, or flaky and tabulated, or wavy and of crooked fibres. It is found ſometimes ſolid in large glebes and plates, ſometimes in grains and detached maſſes from two inches diameter and under, or, laſtly, in micaceous granules, either looſe as ſand, or fixed in incruſtations.

SECT VIII. Its combinations with copper.

There are very few copper lodes, if any, but what have this ſemimetal (which may be called a kind of wild, mock-copper) attending as it were upon them; and therefore, in ſearching for copper, it is reckoned a great encouragement to meet with mundic. The mundic does not intimately incorporate itſelf with the ore of copper; for copper, in its mineral ſtate being uſually of cloſe conſiſtence, repels the mundic, which is therefore eaſily ſeparated from it either by breaking off that which is fixed with hammers, or by waſhing away the ſmall in water, or by evaporation in the furnace.

SECT. IX. with tin.

But mundic unites more cloſely with our tin-ores, eſpecially when found in a lax ſandy ſtate, oftentimes as moiſt and ſoft as mud: in this caſe the mundic mixes intimately with the tin; and, being ſpecifically heavier than the tin-ore, will not ſeparate from the ſame by waſhing as other impurities will, but impoveriſhes the tin, and makes the product ſo brittle, that the tin is worth little or nothing. To deſtroy this connexion therefore, we have recourſe to the following method: When the tin-ore has been ſtamped, that is bruiſed ſufficiently and pulverized by the mill, we put it into a furnace erected purpoſely for roaſting it, called a Burning-houſe. Here the fire muſt be managed and kept very moderate, and the tin-ore raked and ſtirred well every quarter of an hour, otherwiſe the tin will fuſe (eſpecially in the hotteſt part of the furnace), and then it muſt undergo another expenſive trituration in the ſtamping-mill. The gentle fire evaporates the arſenical and ſulphurous parts of the mundic ſooner or later, according to the quantity it has to work upon. 500 pounds weight of black-tin, ſtrongly impregnated with mundic, will take twelve hours roaſting to evaporate the mundic, but the moderately infected ore will throw off the mundic in eight hours; ſo that nothing but the earthy and lighter parts remaining

remaining, thoſe are eaſily waſhed off, and the tin-ore remains behind in ſuch purity, that the melters will give twelve parts of white melted tin for twenty parts of ſuch tin-ore, and this is as good a price as the generality of tin-ore brings.

SECT. X. Its communications with water, earth, and fire, and the ill effects.

Our waters are infected by mundic more or leſs, according to the quantity which they paſs through, and the diſpoſition of the mundic either to retain or communicate the noxious principles of which it conſiſts. Arſenick, ſulphur, vitriol, and mercury are the conſtituents of mundic, yet theſe ſeemingly ſo pernicious ingredients are ſo bridled and detained by their mutual action and reaction, and by mixing with other minerals, that the water is not poiſonous (generally ſpeaking) even in the mine where it proceeds directly from the body of the mundic lode; nay, in the mine, as I am well aſſured, this water will ſometimes cure wounds, bruiſes, and ſores, if the habit of the body be not very corrupt. However, though the mundic in general is ſo retentive of its arſenick that it will not yield it to water, and that nothing but fire can certainly ſeparate it, yet it is not always ſo innocent; for at times it yields that or ſome other poiſon ſo copiouſly, that I have known a tinner of the pariſh of Ludgvan [1], who, by waſhing his wounded leg in a very ſtrong mundic-water in Ludgvan-lez mine, brought on ſuch a gangrene that it ſoon killed him. In the ſame work it was remarked, that the ſmell of the mundic was about that time ſo ſtrong, that it altered the moſt ſanguine complexion of the labourers into pale and languid, and the effluvia of their cloaths were quite loathſome; but in ſome parts of this mine the water was more tainted than it was in others, and the damps and ſteams much more offenſive. At Crowliſs, a village of Ludgvan, in the year 1739, a flock of geeſe belonging to James George, taylor, went into the river as uſual, and, drinking heartily of the water, upon their return to the bank nine of them lay down immediately, and died; but commonly this brook, though of a red turbid colour, by reaſon of the mines and ſtamping-mills through which it makes its way, is not poiſonous, for many horſes, as they paſs daily, drink of it, and receive no harm. This mundic-water however is a great enemy to the finny breed, being either poiſonous at times, or ſo loaded with the dirty *pabula* of metals, that the young ſpawn of fiſh cannot live in it; for it is obſervable, that in ſome brooks, where, about fifty years ſince, there was plenty of fine trout (particularly the river Conar in Gwythien) ſince the copper-mines have thrown into our ſtreams this mundic-water, there is not a fiſh to be ſeen. This mundic-water corrodes iron, by reaſon

[1] Edmund Thomas.

of the vitriol with which it is impregnated, very ſoon; ſo that, in our hydraulic engines, the piſtons of the pumps in copper-mines muſt be made of braſs, or they are eaten away and become uſeleſs in a little time.

SECT. XI. with earth. Mundic mixed with earth will deſtroy all vegetation, its ſalts being too acrimonious and fiery to enter the finer veſſels of plants without rending and utterly ſpoiling them; for which reaſon the mundic, pulverized at the ſtamping-mill, is carried off to mix with the ſea-gravel and clay, and effectually prevents all graſs and weed from growing in gravel-walks.

SECT. XII. with fire. Fire has a much worſe effect upon mundic than the other elements, and throws it into its moſt fatal ſtate; for when it has been ſomewhat burnt, and the ſulphur which ſheathed the poiſonous *ſpicula* of arſenick is diſperſed, the arſenick acts without reſtraint. In the management of the furnace, called the Burning-houſe, great caution muſt be uſed: the arſenick, which flies off from the ore, has ſeveral reſts and pauſes; it fixes upon the ſtem and head of the iron rake which ſtirs the tin, in bunches of white-yellow duſt; and here it is reckoned moſt poiſonous, as being leaſt mixed; but it is alſo ſtrongly poiſonous from the bottom of the flue of the chimney upwards, where, although it is a mixture of mundic, ſulphur, and ſoot of pit-coal as well as arſenick, it is yet ſo fatal, that a perſon of an adjoining pariſh to Ludgvan, raſhly looking down, and prying into the chimney of one of theſe Burning-houſes, was ſeized inſtantly in ſo violent a manner, that, notwithſtanding all proper aſſiſtance, he ſoon died. The workmen are oftentimes obliged to ſweep out theſe furnaces and clear the chimney, a ſervice of no little danger; it is uſual therefore to put a cloth before their mouth and noſe when they are upon this duty; but Elijah Bond, a youth of the pariſh of Ludgvan, ſweeping out what they call the oven, (the place where the tin-ore lies roaſting) at Roſangrows Burning-houſe, January 25, 1750, without the neceſſary precautions, was taken ill immediately, and, though he had the uſual remedy of oil given him, he died that evening.

SECT. XIII. with ſmoke. The ſmoke of burnt-mundic when it leaves the chimney being more diſperſed, is not ſoon, but as ſurely fatal to all tender herbs and plants, and bees of the adjacent neighbourhood, as it lights upon them; and the fire-men, who attend this proceſs, greatly impair their conſtitutions, if they make it their ſole and conſtant employment.

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The three ſorts of mundic above-mentioned, Section VII. differ not only in colour, but in the more deciſive and leſs variable property, weight. SECT. XIV. Weight of mundic.

Plate-mundic ſtriated weighed to water (Auguſt 19 1755) as	6--$\frac{21}{29}$	to 1.
Plate-mundic granulated	7--$\frac{6}{10}$	
Braſs-coloured cubical mundic	4--$\frac{19}{20}$	to 1.
D°. granulated	5--$\frac{8}{28}$	
Brown-mundic	4--$\frac{7}{17}$	to 1.
Second ſample of D°.	4--$\frac{4}{28}$	

The plate-mundic therefore is in weight to water near as ſeven to one; the braſs-coloured is not ſo heavy, being but as five to one; and the brown is ſtill lighter, being but as 4--$\frac{1}{3}$ to one.

Notwithſtanding that the ſpecifical weight of mundic exceeds that of moſt foſſils, and that it has, to all outward appearance of colour and texture, ſuch a near reſemblance to braſs, it is ſo pregnant with ſulphur and arſenick, that, though a fierce fire will melt it, yet will it fly into powder under the hammer, and by no flux hitherto diſcovered can it be reduced into a metal. Notwithſtanding the failure of all former experiments, the appearance promiſed ſo much, that the late learned Dr. Boerhave ſent to me by a friend[m] for all the ſorts of it which could be procured, in ſtrong confidence that he ſhould be able to find out a method of making it turn to account. All the ſorts were accordingly furthered to him; but the death of that great chemiſt ſoon after, deprived us of thoſe aſſiduous and ſkilful experiments, which, under his eye, might have been bleſſed with diſcoveries of great importance. SECT. XV. Its produce.

Mundic will yield in evaporation its quantity of ſulphur and arſenick; but theſe are ſo much eaſier, and at a leſs expence, to be procured other ways, that it is not worth while to endeavour after them by burning mundic. Mr. Boyle[n] procured by diſtillation four ounces of good brimſtone from three pounds of theſe ſtones; and ſays, that they contain particles of copper and iron; that mercury may be thence procured; and that a ſkilful perſon may poſſibly make a profitable uſe of marcaſites, either by fixing the volatile gold or ſilver contained therein, or by graduating ſilver by their means; and Kentmannus obſerves, that ſome marcaſites contain ſilver, others gold, and others both, ibid. The white or plate-mundic far exceeds the other ſorts in weight; and, if I am not

[m] Dr. J. Andrew of Exeter, then at Leyden.

[n] Boerh. Theor. of Chemiſtry, Engliſh.

miſ-

miſinformed °, yields not only arſenick and ſulphur, but a powder very near, if not equal to, and the ſame as ultramarine.

In the year 1750 I had a ſample of the ſame plate-mundic, abundantly mixed with ſpeltre, from a work in Gwynier pariſh. It may therefore be well worth while to enquire farther into this mundic, whether ultramarine may be procured from it in any anſwerable quantity; and, ſecondly, whether it may ſerve the purpoſes, or increaſe the powers and quantity of ſpeltre; and, in continual ſearching, other uſes, not now foreſeen, may probably occur.

SECT. XVI. Mundic concretions formed at different times, and are ſtill forming.

Cryſtals and mundics are frequently found in the ſame beds, and by the inſpection of ſeveral ſpecimens, we may reſt aſſured, that ſome mundics were indurated before the cryſtals, as appears by the plain impreſſion made in the cryſtals which adhered to them, and from which we may eaſily ſeparate them; and other ſpecimens will as readily convince us that they were indurated ſince the cryſtals, being formed into cappings and incruſtations upon the cuſpides of the Corniſh cryſtals, from which they have viſibly received the hexagonal impreſſion. Further: There is great reaſon to believe, that mundics are perpetually forming (as is probably the caſe of all ores) new combinations where they have proper room, liberty, *nidus*, and ſubjects to fix upon; for in the fragment of a Corniſh cryſtal brought me, in the year 1752, from a mine which had layn idle about thirty years, I perceived an incruſtation of granulated beſprinkled mundic beginning to coat the cryſtal in the fracture: now, there is all reaſon to believe, that this cryſtal was broke in the columnar part when the mine was worked laſt, which is betwixt thirty and forty years ago, ſo that this mundic incruſtation muſt have fixed itſelf on this fracture ſince that term. The following accident confirmed the ſuppoſition: Having laid by ſome mundics in a drawer, and coming about two years after to examine them, I found ſeveral glebes of yellow-mundic, which were ſeparated when I put them by, ſticking cloſe together; one glebe had picked up a bit of blue vitriol, a grain of lead, a grain of copper, and a grain of cryſtal; and the yellow-mundic had alſo ſhot round about, and cloſely embraced a piece of the plate-mundic: hence we ſee that the mineral principles are always active, and forming new concretions; and likely this activity is in proportion to the mineral and metallic ſalts which the foſſil contains: here the yellow-mundic was moſt active, as conſiſting of more ſalt than the plate-mundic; but the brown-mundic has more ſalt ſtill than the yellow, and will divide and fall in pieces commonly in any moiſt place, and ſhoot

° By a letter from Dr. J. Andrew from Leyden, 1738.

forth

PL XV

FIGUR'D MUNDICS.

pa 137

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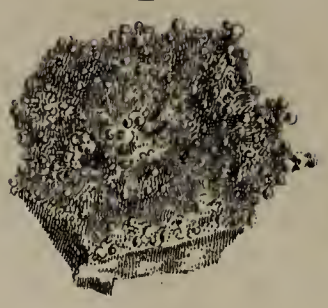

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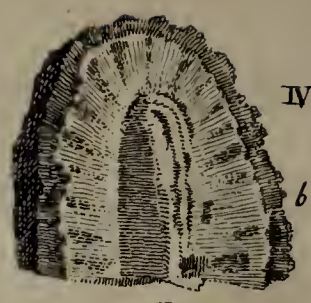

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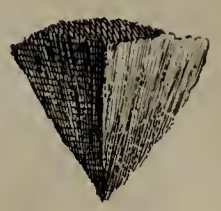

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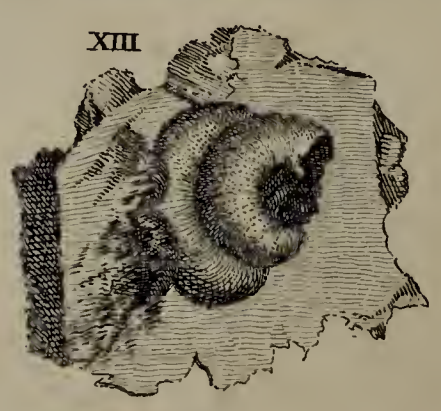

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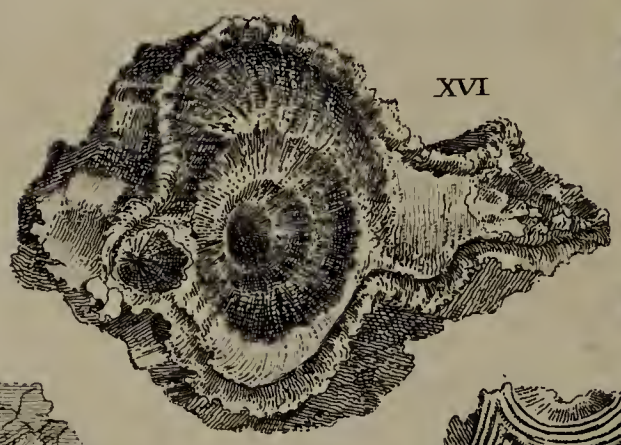

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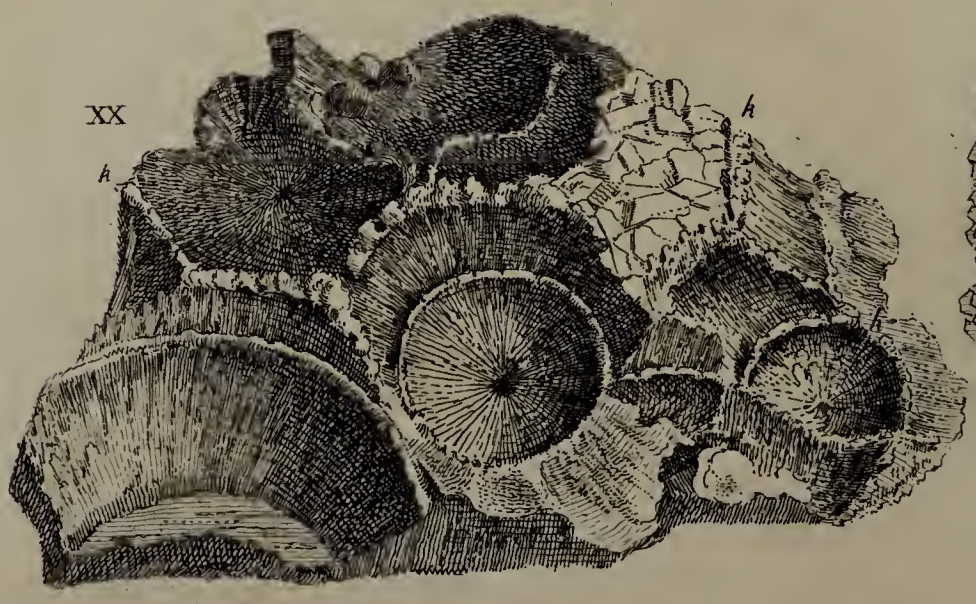

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XXI

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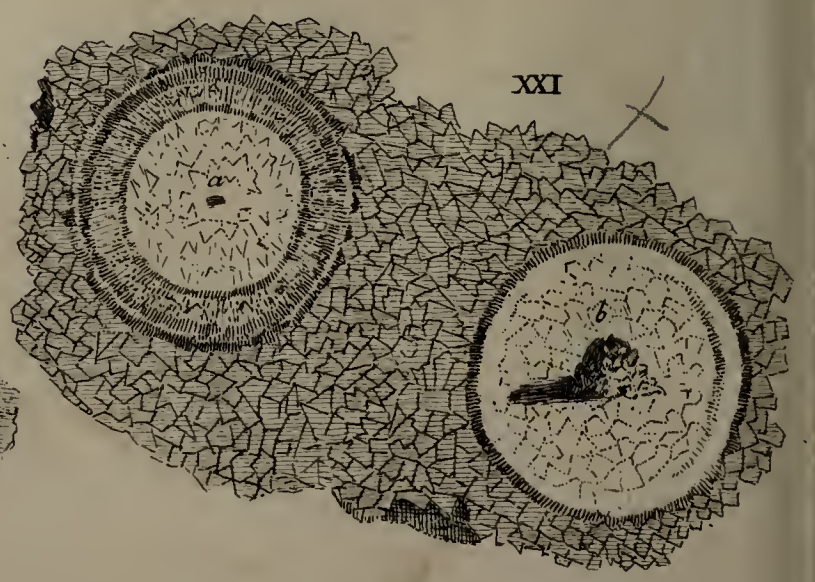

forth its vitriolic ſalts into white wool-like threads: this is therefore the more apt to diſſolve former, and to frame new aſſociations.

SECT. XVII. The various figures of mundics.

Some learned men have thought that the variety of foſſils is greater than that of plants; Mr. Ray doubts it [p], and the eſtimate cannot be made with preciſion till the ſubterraneous parts of nature are as well known as the ſuperficial. Many foſſils have been diſcovered ſince Mr. Ray wrote *; in the year 1716, Doctor Woodward reckoned three thouſand ſorts, and diſtinct ſpecies are making their appearance every day: however, it muſt be allowed, that it is very conſiſtent with the goodneſs and wiſdom of Providence that the ſurface of the earth ſhould be cloathed in a gayer dreſs, and engage the attention of man with a greater variety of colours, ſhape, and beauty, than thoſe parts which lie underneath, and come more rarely under the inſpection of mankind. But nature, where-ever we purſue her, has not left herſelf without teſtimonies of her regard for colour, ſhape, and elegance; this will appear from the deſcription of the figured foſſils which follow, but in none more conſpicuouſly than in the mundics, in which figure, luſtre, gilding, carving, regularity, and finery, are as it were thrown into the ſcale to make amends for its little intrinſic value. As this mineral therefore has been hitherto very ſparingly traced, I have given two plates of the ſeveral varieties which have reached my notice in this county, in a ſearch of twenty years, all in their natural ſize.

PLATE XV. Circular protuberant figured mundics.

Fig. I. Bliſtered mundic of the ſmalleſt grain, a kind of ſtalagmites, or exſudation.

II. Bliſtered D°. of high relievo, the bliſters covered with ſpangles, ſmooth, hexagonal, braſs-coloured, the fibres at *a* ſhooting as from a center, and forming a ſemicircular opening like the arch of a bridge.

III. Surface ſquamous, wrought like the ſcales of a fiſh; its texture radiated.

IV. Part of an oval incruſtation of braſs-coloured mundic, *b*, *b*, within which an elliptical cryſtal pebble, ſhewing at the ſection, by three liſts, the tremulous efforts of the cryſtal when it ſhot.

V. Three lumps of hexagonal, large-ſpangled mundic, capping a piece of cryſtal.

VI. A globe or ball of ſparkling, braſs-coloured mundic.

VII. Part of a round nodulous pyrites; its texture radiated from a central point, by the moiſture of the air divided, and falling eaſily aſunder into taper pegs, as Fig. VIII.

[p] Of the Creation, page 21. * Viz. 1691.

Fig. IX. A botrueid, or high-bliſtered, ſparkling mundic-incruſtation on the cleareſt cryſtal, the colour of the moſt poliſhed braſs.

X. Stillatitious mundic, ſparkling, yellow, pendant, from the Pool copper-work in Illogan [q].

XI. The tubercles or bliſters oval, inclined in parallel direction; on the ſummit they have *mammillæ* or nipples; the ſurface ſprinkled with a gold-coloured and purple powder; the texture brown flaky-mundic, very uncommon. Likely ſtillatitious.

XII. Oval bliſters of the brown-mundic, cluſtered like a pine-apple, ſprinkled with gold powder as the former, on a bed of copper.

XIII. Braſs-coloured mundic of a velvet gloſs, wreathed in the ſhape of a turbinated ſhell, from the mould of which it ſeems to have borrowed its figure, and may therefore be reckoned an extraneous foſſil: from Pendarves. It is one of the cochleomorphites of Dr. Plot, (Oxfordſhire, Tab. VI. Fig. 11.) and what Lhuyd, in his Lithophylacium, calls the *Nerita foſſilis*, N°. 312.

XIV. Bliſters like reclined tubes, formed of parallel rings, as if worms or caterpillers half buried in the ground of mundic [r].

XV. Buttony mundic in five perfectly globular protuberances.

Circular concave mundics

XVI. A wavy bordure, or cordon of braſs-coloured mundic, pointed at one end, and at the other ſpreading into a circle, ending in a ſmall cavity, and incloſing a larger in the ſhape of an inverted cone, which has three ſeveral ſtages of radiated fibres.

XVII. Several ſegments of circles, creſted with a continued aſtragal, which edges a tuft of the largeſt-ſpangled braſs-coloured mundic.

XVIII. A piece of ſpangled braſs-coloured mundic in relieve, with a fringed edging ſhaped by five ſegments of a circle ingrailed, or with the points where they meet outwards.

XIX. This beautiful piece of lace-work is at *o*, ſunk into the moſt exact circular cavity, from whence the ſix liſts or threads turn off on either hand, and protruding themſelves into various angles, and preſerving their paralleliſm throughout, trace round the extremities of this rare ſpecimen. From a tin-mine, called Ludgvan-lez work, in the pariſh of Ludgvan.

XX. On the top there is a molding of fringy, tufted, braſs-coloured mundic, which divides the ſpangled ſurface into compartments, as *k*, and makes the upper brim of the cavities with which this ſpecimen is ſo diſtinguiſhed. Below this tufted edge runs a moſt exact circular liſt, *h*, *h*, *h*, which gives great regularity to the cavities underneath. This liſt has little breaks in it, like an aſtragal

[q] See of this ſort two other ſpecimens, Pl. XVI. Fig. XXXIV. and XXXV. page 141.

[r] See Plate XVI. Fig. LIV, LV, LVI. page 141.

of

of bead-work in architecture. Beyond the circular cavities are ſome angular ones, as if for variety.

Fig. XXI. The colour of the higheſt poliſhed ſilver, the circles moſt exact, ſomewhat concave, edged with a beaded aſtragal; *a*, is about the tenth of an inch deep, radiated as in the ſculpture; *b*, has a taper hillock of the ſame ſpangled mundic in its center, and ſome faint traces of rays round it. This is part of a large rich incruſtation of the plate-mundic on milk-white cryſtal. The ſpecimen is one third of an inch thick, nine inches long, and five wide, at a medium, with ſeventeen cavities ſunk in its ſurface, nearly of the ſize of what are here exhibited, five of which have in their center the little hillock, *b*: it coated the ſide of the mine, ſo that its ſurface was not horizontal but perpendicular. From the ſame mine.

XXII. On a greeniſh ſparkling mundic, a liſt of ſmall beads edging like a gold twiſt, the flap (as it were) of a pocket, imboſſed. PLATE XVI Page 141.

XXIII. A mundic figure, imboſſed in the ſhape of a ſpear's head, carved at the edge.

XXIV. On the top of a yellow-ſpangled mundic is this flower in high relievo, lying ſingle and entire, carved at the edges, ſparkling with gold duſt; it does not conſiſt of circular lines only, but is a curious mixture of ſtraight and ſpherical, not much unlike the form of an ancient harp.

XXV. An emboſſed flower, carved at the edges, like a gooſe-head, of gold-colour'd ſpangled mundic, covered with a ſparkling ochrous glidder.

XXVI. A bird's head (as it were) emboſſed, on a thin plate of purple-ſpangled mundic powder'd in ſome parts with gold duſt.

XXVII. A regular triangle of ſpangled yellow mundic carved at the edges.

XXVIII. Granules of braſs-coloured mundic placed in a rhomboidal order, fixed on white opake Quartz.

XXIX. A cluſter of ſpangled mundic, with ſtems underneath, at *a*, *a*, perpendicular to their brim, fibrous, lacerated like the body of a broken nail; braſs-coloured, ſeemingly of the fungoeid kind.

XXX. Creſted with grains rectangular, ſpangled; at *b*, *b*, it has two ſtalks or ſupporters like the roots of a tooth, braſs-colour'd, fungoeid.

XXXI. It's creſt is tufted, the roots of parallel fibres or threads, like the fungi; marked tranſverſly by three indented furrows; braſs-coloured.

XXXII. Creſted as FIG. XXX. but not indented; fungoeid.

XXXIII. Under a cap of leafy, rectangular mundic, *d*, a wavy girt or bandage, of mundic lace, *e*, *e*, ſurrounding the whole, the threads perpendicular, croſſed and divided into fillets by protuberant liſts;

liſts; braſs-coloured; fungoeid. There is a fungoeid in ſtone, in Lhuyd's Lithophylacium, N°. 122, very like this ſpecimen; of which he alſo gives an Icon. He calls it *columellus fungum Niloticum Cluſii, nonnihil referens, ex lapicidina Cowleiana:* Theſe are all the φυλοειδ mundics I have met with.

Fig. XXXIV. Mundic ſtillatitious, in perpendicular, capillary tubes, both ſurface and texture ſmooth, of a cinereous lead-colour.

XXXV. A cinereous, ſtillatitious, tubulary mundic, the pipes of different diameter and lengths, and in regard to one another parallel as the pipes of an organ.

Geometrical angular mundics.

XXXVI. On the ſurface, thin wedges, acuminated, as if ſmall bits of a knife or ſword, not parallel, but with their edges turned upwards, ſtanding out of the bed.

XXXVII. A ſhoot of mundic, columnar, the baſe at *f*, a rhombus, but at *g* the ſide angles are planed off, ſo as to make the column there hexagonal. Of plate-mundic.

XXXVIII. A rhombo-columnar clump of plate-mundic. The columns make different angles at their inſertion; the baſe a rhombus, which in one place has its ridge planed of, as at *g*, in the foregoing figure.

XXXIX. A rhomboidal ſingle die of mundic, pale braſs-coloured.

XL. A clump of intimately connected cubical mundic, poliſhed, braſs-coloured.

XLI. Two cubes of mundic inſerted in each other's ſubſtance, therefore ſhot at the ſame time, but by forces differently directed. *N. B.* Where equally immerſed, and of equal dimenſions, the forces and materials were equal.

XLII. A perfect cube of mundic, of burniſhed braſs-colour.

XLIII. A polyhedron; its ſurface conſiſting of thirteen pentagonal planes.

XLIV. The ſurface is divided into twenty triangular planes, five of which make a pentahedral cuſpis at one end, and five make the like cuſpis at the oppoſite extremity, the other ten triangles compleat the ſpace or fillet betwixt the two cuſpides; a moſt remarkable polyhedron this, and perhaps as curious a diſpoſition of triangles as is any where to be met with. Braſs-coloured.

XLV. A bunch of mundic rhombus's with their points planed off.

XLVI. Another view of the ſame ſubject, ſhewing the front of the chief rhombus, as *a*.

XLVII. An exact equilateral triangular ſide of a mundic pyramid with a ſmall one of the like figure on each ſide, in different directions.

XLVIII. One grain of mundic; its ſides and ends cut in the ſegment of a circle, and convex in the front, *b*.

Fig.

FIGUR'D MUNDICS.

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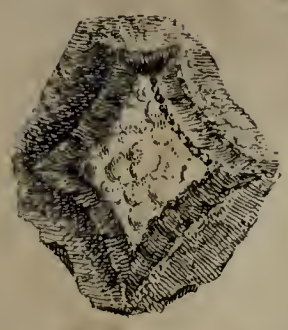
XXIII



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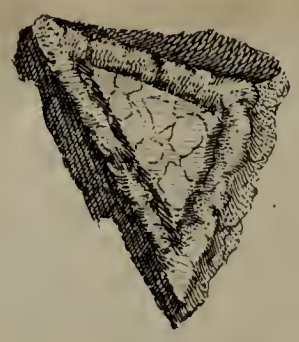

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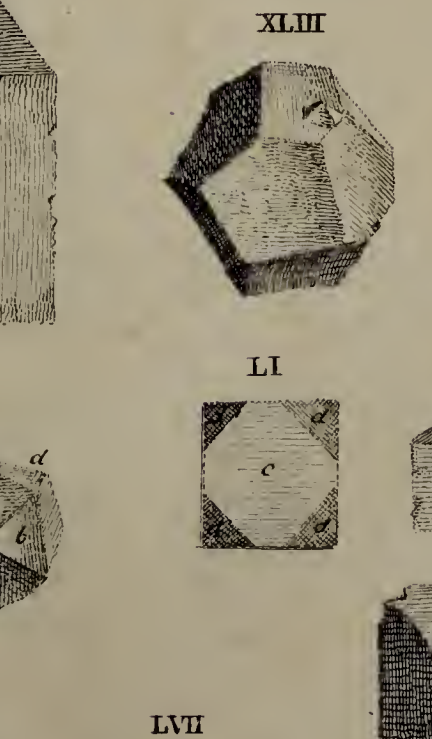

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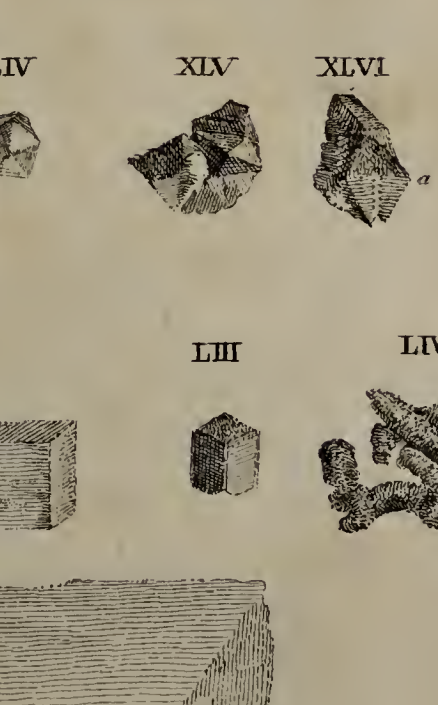

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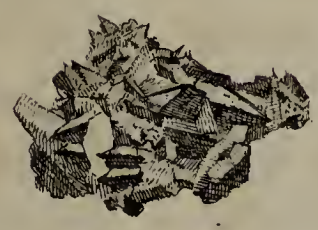

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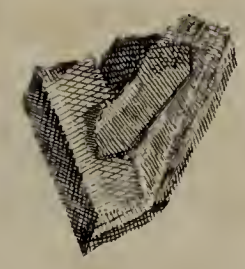

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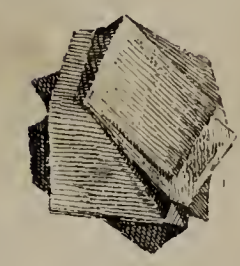

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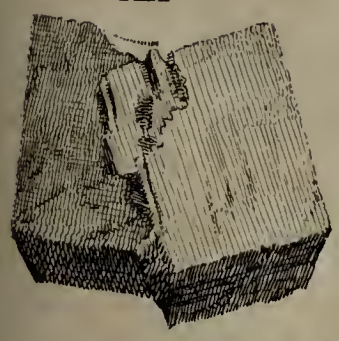

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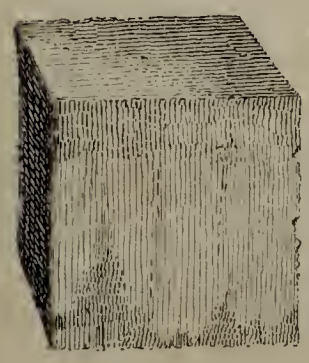

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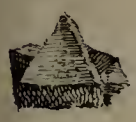

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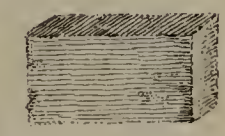

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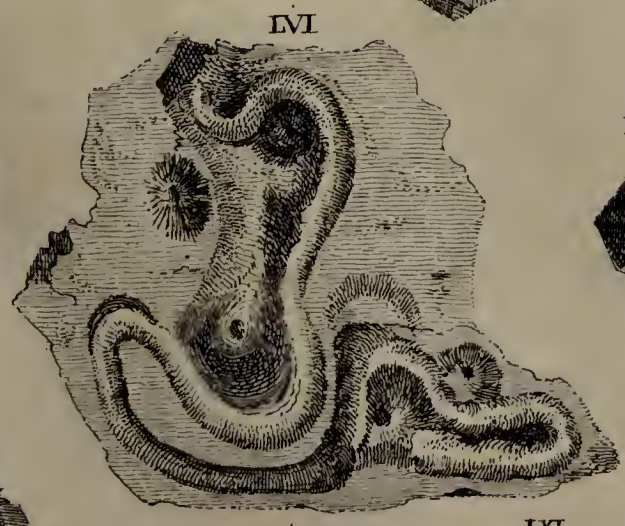

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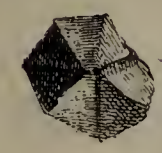

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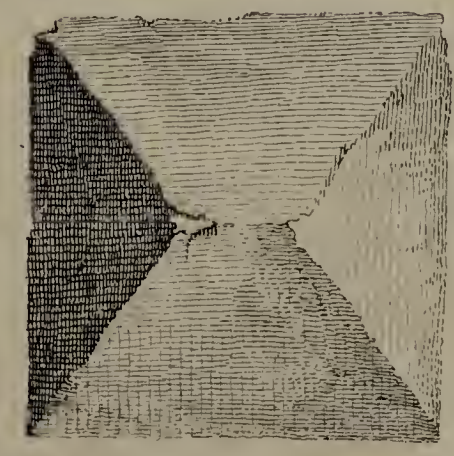

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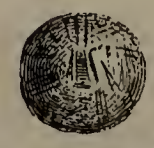

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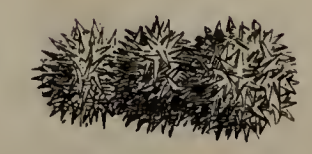


To M.rs Mary Basset of Haldane in Devonsh: This Variety of Mundics in two Plates, engravd at her expence is most gratefully inscribd by. Wm: Borlase.

Fig. XLIX. A cubical die of mundic, with its rectangles planed off, as *c*, *d*, *e*.

L. A rhombus, *a*, betwixt four ſlopes; the two uppermoſt, *d d*, triangular; the two underneath, *b b*, incomplete triangles; their apices planed off. From Huêl-Cock in St. Juſt, 1750.

LI. Another view of the ſame mundic-grain, exhibiting the octogon, *c*, betwixt four triangular ſlopes, *d*, *d*, *d*, *d*.

LII. A very exact parallelopiped of a gold-colour.

LIII. A cube of mundic with this peculiarity, that it has five of its eight angles with their apices as it were cut off, and yet of the ſame poliſhed ſurface as the reſt of the cube.

LIV. A piece of tubulary-wreathed, braſs-coloured, ſparkling mundic.

LV. Another ſpecimen of the ſame kind, braſs-coloured.

LVI. A vermicular ſcroll of mundic, thrown into irregular meanders as if once the habitation of an inſect. *N. B.* Theſe may be called *Vermicularia glomerata*, as Lhuyd calls the ſtony foſſils of of like ſhape (Lithophylacium, N°. 1215) from the ſtone quarries near Thame in Oxfordſhire, and may ſerve to ſhew that we have extraneous foſſils of the vermicular, as well as teſtaceous, and fungoeid kind in mundic [s].

LVII. A heptahedral cuſpis of yellow, poliſhed-mundic.

LVIII. A tetrahedral cuſpis of braſs-coloured mundic, with two oppoſite ſides quadrangular, two triangular.

LIX. Tetrahedral cuſpides of mundic, the ſides triangular.

LX. Two pyramids of a quadrangular plan joined baſe to baſe.

LXI. Wire-wrought, globular, buttony mundic, from the Pool copper-work, 1756.

LXII. Another variety of the ſame.

LXIII. A third.

LXIV. Three echinated balls of buttony-mundic connected. From the ſame mine.

Here we have in mundic the reſemblances of plants and animals, the moldings, caſts, and carvings of fancy, the figures of ſcience and erudition, and more varieties will occur doubtleſs to thoſe who ſearch longer and with greater attention than I have done; but theſe are enough to ſurprize us with their regularity and art. The firſt of theſe may proceed from natural principles (ſuch as mineral or metallic ſalts) determined to act in a particular manner, although to produce ſuch a multiplicity of geometrical, ſpherical, and rectilinear figures, as are here exhibited, theſe principles muſt be very

[s] The following figures are ſupplemental; the four firſt belong to the claſs of geometrical mundics, as the laſt four do to the convex circular mundics.

 various;

various; but to what ſhall we attribute thoſe freer ſtrokes of art, whereby the curved lines and liſts are ſometimes plain, ſometimes carved, as in Fig. XX. Plate XV. now radiated, now plain, as in XXI; now wavy, more numerous, and exactly parallel, as in XIX; now a mixture of ſtraight and circular fillets, as in XX. Trigonometry, now ſtraightlined, as in XXVII, XXVIII, &c. now ſpherical, as in XVII, XVIII. XXII, &c. and now the moſt elegant mixture of both, as XXII, XXIII, XXIV, &c. now plain, ſmooth globes, as XV; now wire-wrought, buttony, as LXI, LXII, LXIII, LXIV. now tubular and pendant, as X, XI. XXXIV, XXXV. now wreathed and vermicular, as XIV. LIV, LV, LVI. Shall we attribute this to a plaſtick power ſuperintending the congreſs of foſſils, and ſporting itſelf with natural or preternatural repreſentations; or ſhall we rather ſay, that the great power which contrived and made all things, needing no delegate, artfully throws the flexile liquid materials of the foſſil kingdom into various figures, to draw the attention of mankind to his works, and thence lead them, firſt, to the acknowledgement, then to the adoration of an intelligent being, inexhauſtibly wiſe, good, and glorious? Doubtleſs theſe are the works of that ſame lover of ſhape, colour, and uniformity, that paints the peacock's train, that veins the Onyx, that ſtreaks the Zebra[t]: It is the ſame hand whoſe traces we may diſcover even among the meaneſt and moſt obſcure foſſils. God loves ſymmetry, gracefulneſs, elegance, and variety, and diſtributes them for his own complacency as well as glory, limits them not to plants, and animals, and open day-light, but, like a great Maſter, habitually imparts them to all his works, though in the deepeſt ocean, and in the moſt ſecret parts of the earth.

CHAP. XIII.

Of the Fiſſures in which Metals are found; their Properties, Origine, and Uſe.

SECT. I.

THE greateſt part of our metals is found in veins or fiſſures, and the contents which fill theſe veins we call in Cornwall Lodes. We will examine the ſhell firſt, and then conſider the kernel.

SECT. II. Properties.

The ſides or walls of a fiſſure do not always conſiſt of one and the ſame kind of ſtone, nor are they are equally hard; on one ſide

[t] The female Zebra, or wild-aſs of Africa, was drawn and publiſhed by the ingenious Mr. Edwards, librarian to the College of Phyſicians, London, from the living animal belonging to his Royal Highneſs the late Prince of Wales, and the male, ſtill more remarkable for the regularity of its ſtreaks, from the ſtuffed ſkin preſerved in the College of Phyſicians, in the year 1751.

of

of the fiſſure there is hard ſtone, on the other ſometimes looſe clay; the walls, generally ſpeaking, are harder than the lode they incloſe, but ſometimes ſofter; ſometimes perpendicular, but much oftener declining ſomewhat to the right or left as they deſcend, but without any certain rule, and without any uniform relation to one another. Fiſſures are not of equal breadth or depth: The courſe of fiſſures (eſpecially great ones) is generally eaſt and weſt in Cornwall, yet in ſome places have a north and ſouth direction; but in neither caſe do they exactly tend to the cardinal points: their courſe, to whatever point they are directed, is not in a ſtraight line but wavy, full of little curves, alternately deviating from and recovering their chief direction; the curves they make are generally greater at croſſing a valley than otherwiſe; the larger fiſſures have many leſſer veins branching out from them, which decreaſe, like the boughs of a tree, as they become farther diſtant from the trunk, till they end in threads, and are no more to be found; theſe ſubordinate dependant veins join the maſter-fiſſure at different angles.

SECT. III. Origine of fiſſures.

Let us now conſider the origine of theſe fiſſures, and the cauſe of their ſeveral properties. As to their origine, the learned are not agreed. Some [v] imagine them to be the chanels through which the waters retired at the time of the creation, that the ocean might be formed, and the dry-land appear; that where a large ſtream chanced to force its way, the paſſage became wide; where only a petty current, the paſſage was proportionably narrow: but to this may juſtly be objected, that the walls of the fiſſures are too hard in many places for the waters to have penetrated, in others too ſoft to have reſiſted the leaſt impetuoſity of ſuch a current. Their courſe does not at all agree with this theory; for they run moſtly eaſt and weſt, or towards the other cardinal points; whereas, if they had been formed by waters retiring into the ſea, they would thither generally tend; but we find no ſuch diſpoſition, nor the leaſt regard to the ſea in their tendency.

Others think them [w] ſo many breaches of the *ſtrata*, made at the concluſion of the univerſal deluge; whence it would follow, that there was neither fiſſure nor lode before: but that the lode was prior to the flood, the ſhodes*, which have been diſperſed from the top of the lode by the flood, inconteſtably ſhew; and that the fiſſure muſt be prior to the lode it bears, is as evident as that the cabinet muſt have been made before the jewels could be incloſed and laid up in it. In ſuch matters however it is more difficult to aſſign the true cauſe, than to confute the falſe ones; but in all

[v] Agricola de ortu, &c. lib. iii. page 39. [w] Woodward's Nat. Hiſt. page 187. * Looſe ſtones.

ſuch

ſuch doubtfnl points, Naturaliſts are to ſubmit their own ſentiments to the examination of the publick, that by a variety of hints, and the joint aſſiſtances of all, the truth may at laſt appear.

Firſt then thoſe fiſſures are no more, as they ſeem to me, than the neceſſary conſequences of the firſt ſettlement of matter, when it was divided into wet and dry, ſolid and fluid. That we may the more clearly apprehend this, let us recollect what happens to ſmall maſſes of matter, cloven by like fiſſures, whence we may infer what is probably the cauſe of thoſe greater clefts which we are now in ſearch of. We all know that ſlime, diluted clay, and pulverized or diſſolved ſtone, ſhall occupy more ſpace in that ſtate of moiſture than when the ſame clay, ſlime, or ſtone, becomes dry and hard; and, from a parity of reaſon, we may argue, that when ſolids and fluids formed (and from a ſtate of chaos became divided into diſtinct bodies) the parts of the former, being deſerted by the latter, muſt needs grow cloſer together, and conſequently leave chaſms and crevices betwixt them. But the maſſes of earth, ſtone, and clay, were not at this time meerly paſſive; they formed larger and more compact bodies every where, in proportion to the quantity and mutual attraction of their ſimilar parts, within proper diſtance. Hence aroſe firmer combinations, and conſequently greater openings between ſuch maſſes. Farther, it muſt be obſerved, that as all ſimilar particles ſtruggled to come into contact with each other, ſo, at the ſame time, they deſerted, repelled, and expreſſed all diſſimilar and contending particles; conſequently maſſes of differently natured particles ſeceded and fled from each other, every party (if I may uſe the expreſſion) tending to form and ſtick cloſe to its like: betwixt ſuch different ſubſtances therefore, attracted here, and there repelled, ſome chink or interval muſt needs happen. Theſe cauſes then, *viz.* the deſertion of moiſture, the union of ſimilar and the mutual repulſe of diſſimilar particles, muſt all have contributed to form the maſſes of our terraqueous globe into ſuch ſeparate portions as we now find them in; for that indeed it was not poſſible for bodies to grow dry and hard, unite and contract, without leaving ſome chaſms or fiſſures between them. What enſued upon the hardening of particular and ſmaller maſſes, enſued alſo in the larger portions of the whole earth, in proportion to the quantity of ſolids united at any one effort, whether a grain, a *ſtratum*, a county, or a region. Hence therefore the cracks in all foſſils, whether filled with heterogeneous matter or open; hence the clefts and ſeparations of the *ſtrata*, whether horizontal, perpendicular, or oblique; and hence the larger diviſions or fiſſures which divide whole counties into as many ſubterraneous diſtricts, whether charged with ſtone, metal, or earth, or kept open by the conſtant courſe

of

of running waters. The largeſt fiſſures which we are apt to wonder at, extending themſeves in one direction for ſo many miles, are no more to the body of the earth than the ſmalleſt, and to the naked eye inviſible clefts in bricks, ſtones, and minerals; they are but ſo many terminations of the effort, whereby ſimilar, ſoft, and moiſt bodies contracted themſelves, and paſſed into drought and hardneſs. I need not ſay, that, according to this theory, the paſſage of the waters through thoſe clefts was the conſequence and effect and not the cauſe of theſe fiſſures, as Agricola ſuppoſed. Which is moſt likely, muſt be ſubmitted to the candid reader; but the above account ſeems to be confirmed from a very common and juſt obſervation, that where the fiſſures are wideſt, there they are feweſt; and, on the other hand, proportionably ſmall where they are moſt frequent; both equal evidences, that the concreting glebes could not harden without cracking to a certain degree; that, where a large chink enſued, it anſwered all the exigencies of the contracting-maſs; but where the crevice or eaſement to the forming-maſs was but ſmall, there many cracks did ſupply the place of a large one.

SECT. IV. Properties, and their cauſe.

That the breadth, depth, and length of theſe fiſſures are all different, ſhews that they are not the effects of any exact rule, but the product of ſome natural immechanical operation, on a various, mixed, and unſettled congeries of bodies concurring to form themſelves in different ſhapes, quantities, and poſitions.

Direction.

There ſeems to be ſome uniformity in the direction of our Corniſh fiſſures, pointing, as they generally do, eaſt and weſt. In the coal and lead-mines throughout England, they generally do the ſame as Mr. Ray obſerves (Phyſicotheol. page 378); but, from ſuch ſmall ſpots, nothing certain can be concluded; and there are ſo many fiſſures in contrary and more oblique directions, that no uniformity in general can be preſumed. The four principal veins of Potoſi run north and ſouth, and thoſe of Oruro, reckoned the ſecond beſt in Peru, have the ſame courſe, though on a different ſide of the mountain. At Schemnitz, in Hungary, the veins of ſilver-ore run north and ſouth, other rich veins north-eaſt; all veins keep not to the ſame point, even in the ſame mine." Brown's Travels, pa. 57. Of the gold-mines, in Schemnitz, ſome run to the north, ſome to the eaſt, ibid. page 63. In the mines of Gottenberg, in Bohemia, the veins of ſilver and copper run ſouth, ib. page 162.

Magnitude.

That the north and ſouth fiſſures ſhould be generally ſmaller than the eaſt and weſt ones, is merely accidental; for they are ſometimes as large, and larger. In general, we may conclude, that the fiſſures were large or ſmall in proportion to the activity of the contracting maſſes on either ſide. Again, as the forces of that con-

traction, which formed the maſter-vein, gradually ceaſed and died away, the ſubordinate cracks and little ſide-veins, proceeding laterally from the ſame forces, became leſs and leſs as they became more diſtant from the chief ſource of motion.

Poſition perpendicular.

Fiſſures are either perpendicular, inclined, or horizontal. The general poſition of fiſſures, at firſt, was probably the perpendicular or near it; for it is a common obſervation, that the fiſſure, which inclines much near the ſurface, grows gradually more upright, as it ſhoots deeper into the earth, where the *ſtrata* are uſually more compact, and conſequently more apt to have preſerved the primary poſition than thoſe which are nearer the ſurface, and therefore more liable to have been diſturbed.

Inclined.

Fiſſures inclined (that is, deviating from their perpendicular, as indeed moſt of them do) owe their obliquity partly to the firſt irregular contraction of the *ſtrata*, and partly to ſome after-violences, whereby the neighbouring *ſtrata* were unfooted, and, in proportion to their own ſubſidence, inclined and bent from their natural poſition every thing in their reach, as will more clearly appear in the examination of the properties of lodes in the following chapter.

Horizontal.

Horizontal fiſſures are owing probably to the accidental interpoſition of hard and different bodies, whereby the *ſtrata* were kept from contact and ſettling cloſe upon one another, and partly to the different efforts of the upper and under maſſes at their firſt induration. By either of theſe cauſes, or by both conjointly, horizontal chaſms in the *ſtrata* might be formed; but they are much leſs frequent than the perpendicular and inclined. We find them ſometimes replete with metals and minerals, and call them floors, not lodes.

Some fiſſures are quite broken and diſcontinued, and the deſerted fragment, from which they have been divided, found again at a ſmall diſtance: this is alſo the effect of violence, and will come to be particularly explained among the properties of lodes.

SECT. V. Uſe of fiſſures.

Although theſe fiſſures are the natural reſult of a moiſtened and mixed congeries of matter, paſſing by approximation of parts into a ſtate of ſolidity and drought, we are by no means to conclude them uſeleſs, or the works of chance, produced without or beſide the deſign of the firſt cauſe: No; the great Architect, who contrived the whole, determined the ſeveral parts of his ſcheme ſo to operate, as that one uſeful effect ſhould become the beneficial cauſe of another. God provided for the uſes of things in his firſt ideal diſpoſition of them, and their reſpective beneficial uſes flowed naturally from each other thus aptly diſpoſed. Hence it happens that matter could not contract itſelf into ſolid large maſſes without leaving

leaving fiſſures between them; and yet the very fiſſures are as neceſſary and uſeful, as the *ſtrata* through which they paſs.

Firſt, theſe are the drains which carry off the redundant moiſture from the earth, which, but for them, would be too full of fens and bogs for animal to live or plants to thrive on.

Through theſe fiſſures the rain, which ſinks beneath the chanels of rivers, not having the advantage of that conveyance above ground, returns into the ſea, bringing the ſalt and mineral juices of the earth into the ocean, enabling it thereby to ſupply the firmament with proper and ſufficient moiſture, and preſerving that vaſt body of water the ſea, wholeſome, fit for fiſh to live in, and ſailors to navigate.

In theſe fiſſures, the ſeveral ingredients, which form the richeſt lodes, by the continual paſſing of waters, and the *menſtrua* of metals, are educed out of the adjacent *ſtrata*, collected, and conveniently lodged in a narrow chanel, much to the advantage of thoſe who ſearch for and purſue them; for if metals and minerals were more diſperſed, and ſcattered thinly in the body of the *ſtrata*, the trouble of finding and getting at metals (thoſe neceſſary inſtruments of art and commerce, and the ornaments of life) would be endleſs, and the expence of procuring exceed the value of the acquiſition.

Laſtly, without theſe fiſſures we could never make drains to our mines and quarries, and conſequently neither metals nor marbles, neither ſalts nor earths, nor ſtones, could be ſo eaſily, or in ſuch plenty provided as is neceſſary for the uſe of man.

CHAP. XIV.

Of Lodes; their Properties, Parts, and Inclinations, &c.

SECT. I.

FROM the fiſſures, let us proceed to that which they contain, and whatever fills them, whether clay, ſtone, mineral, or metal, we call in Cornwall a Lode, and not improperly; for a lode is very ſeldom rich, or equally impregnated; metals are local, diſtributed ſparingly, not beſtowed without reſerve, found in ſome, not in all parts of the lode; but, where the lode is barren, it may ſerve to lead us to what is rich, whence the name lode of the ſame ſignification as the Engliſh word, lead, or led[x].

SECT. II. Properties of the lode.

Firſt, let it be obſerved, that if the general run of the neighbouring *ſtrata* be of any particular colour, be lax or compact, be of a ſpar or cryſtal cement, be of ſlat, granite, or any other ſtone,

[x] From an old Angloſaxon word, lode, idem ac lead; ſo lode-ſtone quaſi leading-ſtone. See Lye's Edit. of Junius ad verbum.

ſo

ſo will the lode be for the moſt part. Again, the ſubſtance of the lode is obſerved to be frequently the ſame, at the ſame level and depth with that of the *ſtrata*; but though there is oftentimes ſuch an agreement betwixt the lode and the *ſtrata* near it, it is far from being always the caſe: in the foſſil grammar there is no general rule without many exceptions, experience convincing us, that ſometimes lodes are both as to colours and textures, as well as impregnation, entirely different from the adjoining *ſtrata*[y]. However, the general reſemblance betwixt the lode and the ground adjoining, may probably conduct us to the true origine of lodes; for as ſoon as the fiſſures were made by the contraction of the *ſtrata*, whatever did not join the hardening maſs was carried off by the *expreſſed* moiſture into the adjoining fiſſures, the waters depoſiting what they brought with them where-ever a proper *nidus*, or ſufficient attraction to arreſt it, occurred; that the little collateral veins are oftentimes filled, and at the ſame depth with like ſubſtance to the maſter-lode, will convince us that they were filled at the ſame time, by one and the ſame cauſe, and from one common repoſitory. The contents then of the fiſſures proceeded from the neareſt *ſtrata*; and if the openings of the *ſtrata* into the fiſſures were horizontal, then the cavities were filled at equal depths with the ſame ſubſtances; but if the communications were in any other direction, as frequently they muſt needs be, and indeed are ſo found, then the depoſited matter is not found at equal depths in *ſtrata* and fiſſure, but higher or lower, in ſuch quantity and direction, as the vacancy of place, the oppoſition or compliance of other bodies, and the reſpective gravitations of the adventitious matter, ſhall have diſtributed it.

SECT. III. Of the broil or top of the lode.

That part of the lode which is incloſed betwixt the two walls of the fiſſure, is called the body of the lode, but the fiſſure ending with the karn[z], the lode has its top covered over with a parcel of looſe ſtones and earth, uſually of the ſame impregnation, though in a leſs degree, of the ſame colour and cement as the lode, and this in Cornwall we call the broil of the lode. See Plate XVII. Fig. VII. D. p. 149. This broil not being confined betwixt walls, as the lode is, is frequently found to have been diſturbed, and ſometimes wholly diſſipated, eſpecially when the walls of the fiſſure reach up to day, as they do in naked karns; but where there is a layer of rubble or ſtiff deep clay above the fiſſure, which is much oftener the caſe, then the broil is always found covering the lode, and

[y] Hutchinſon is therefore too general in his following obſervation on the ſtrata of Cornwall, Tracts, page 86. "Where the ſpar and the talk happen to be different at different depths in the ſtrata, there are *ever* the like in the ſame depths in the vein; that of the vein being *ever* of like kind with that of the ſtratum."

[z] That is, the rocky ſtratum.

brooding,

Fig.I. *Declination of the Strata towards Rivers.* pa.153

Fig.II. *Dipping of the Strata in Valleys.*

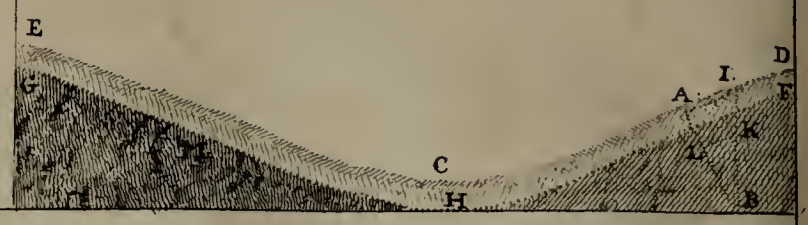


Fig.III. *Dipping of Lodes towards the Sea.* pa.154.

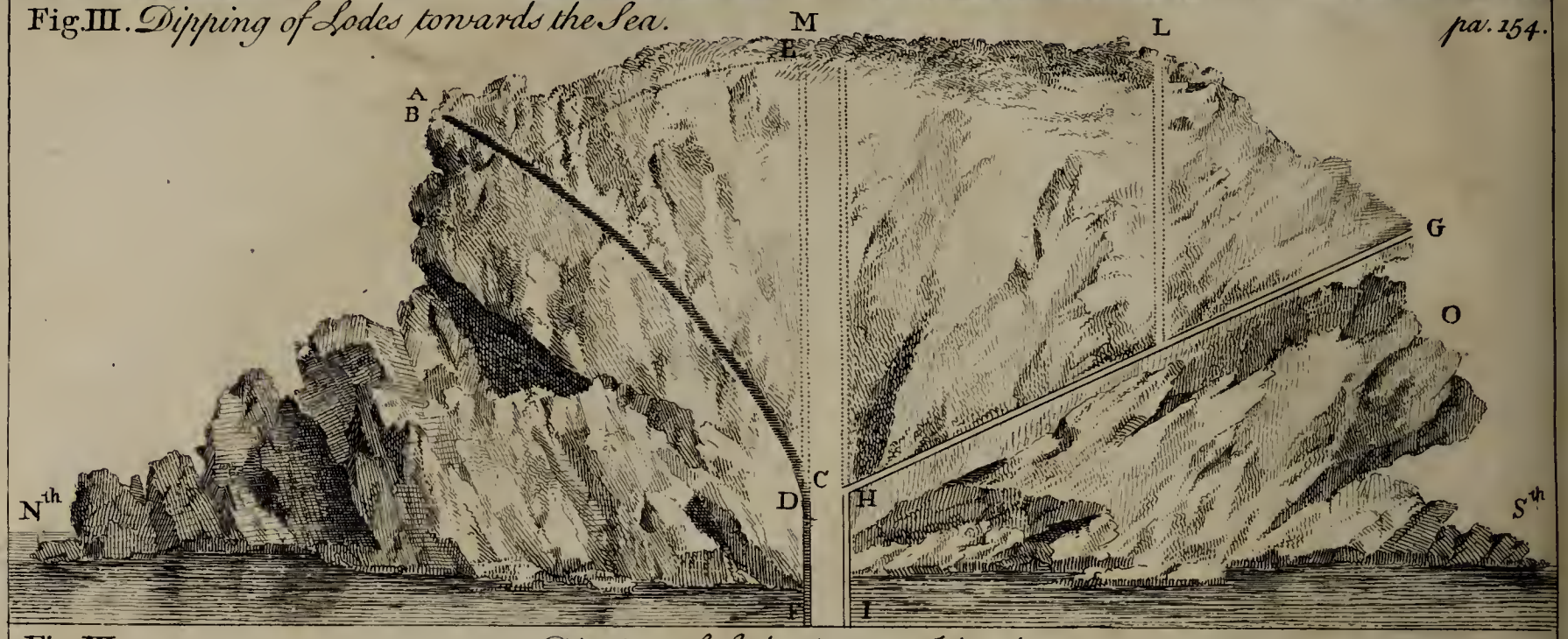


Fig.IV. *Dipping of Lodes in an Island.* See pa.155.

Fig.V. *Starting of Lodes.* pa.157.

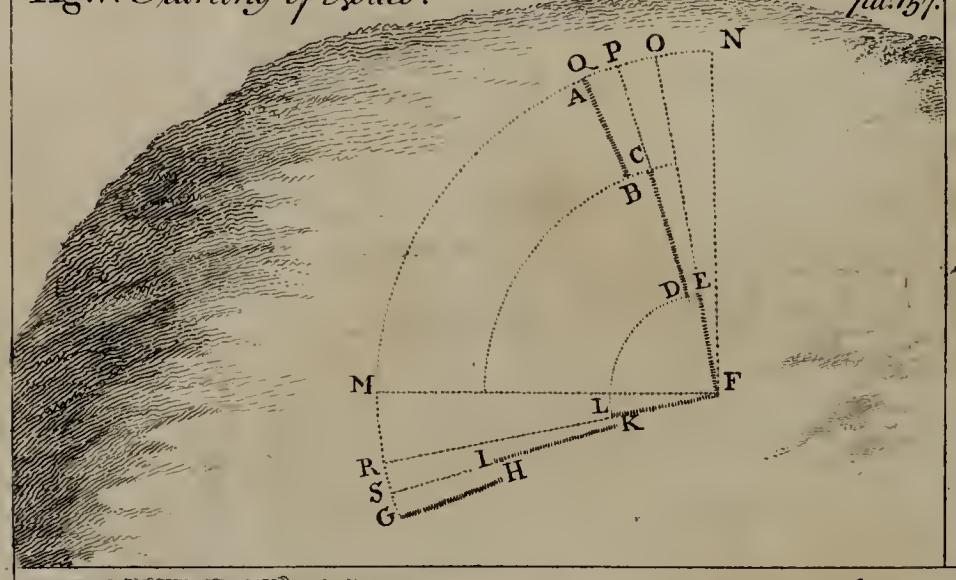


Fig.VI.

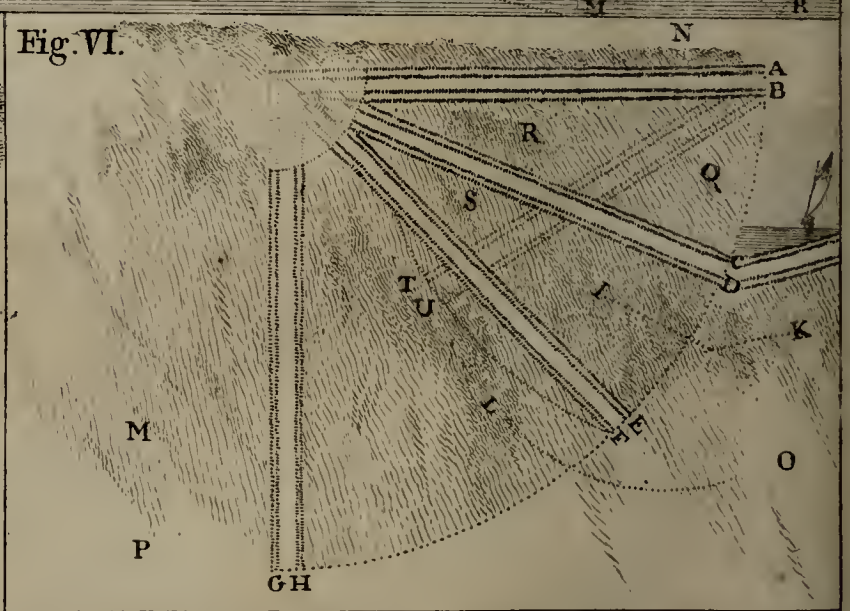


Fig.VII. *Section of a Lode, it's broil, & shodes. pa.149 &c.*

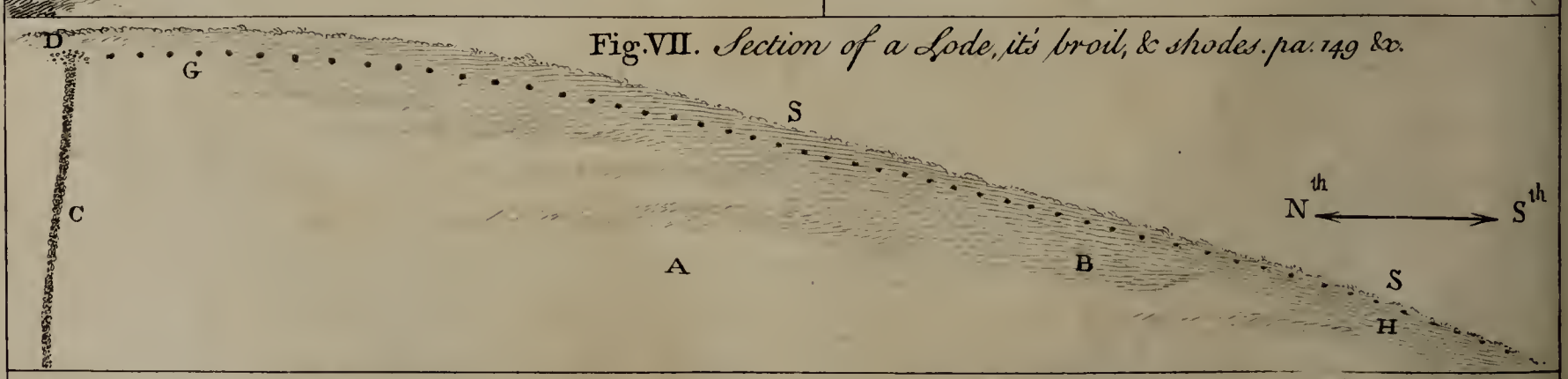
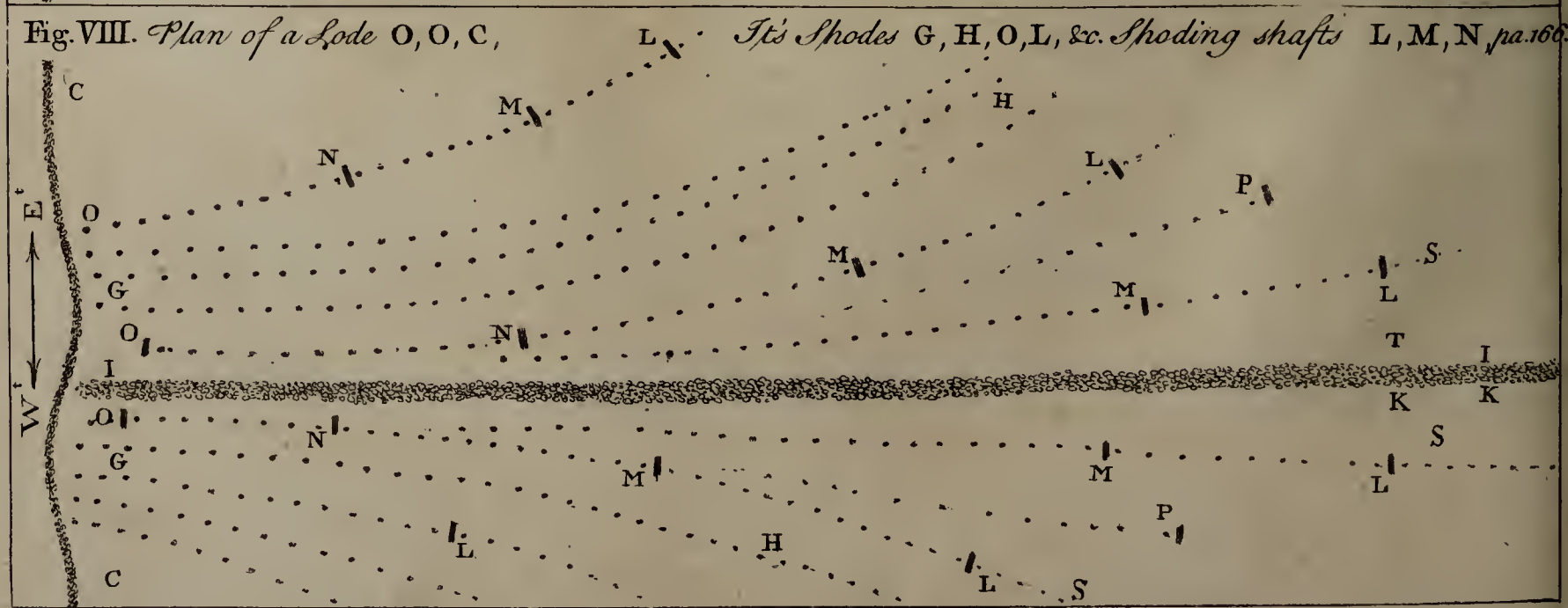


Fig.VIII. *Plan of a Lode* O, O, C, *Its Shodes* G, H, O, L, &c. *Shoding shafts* L, M, N, pa.166.



brooding, as it were over the treaſure underneath. It is ſuppoſed by ſome that this broil was collected and depoſited where we find it by the waters of the deluge [a]; but if the parts of the broil were fortuitouſly caſt together, they would not be of the ſame nature with the lode underneath; they would alſo be found diſperſed in other parts without diſtinction, as well as where they are; whereas they are found only upon and above the lode: in ſhort, the broil is only the more ſhattered and leſs impregnated part of the lode, which, when the fiſſure was filled, wanted cement and a proper *nidus* to fix it into a more compact ſtate; and being deſerted, as it were, by the purer parts of the lode which ſettled below, became expoſed to the impurities of the ſurrounding earths, and liable to be diſperſed by floods.

Firſt, The broil is found in greater quantity in the vallies than on the tops or ſides of hills; in the level grounds, it is but juſt moved from its firſt ſtation, and ſpread on each ſide the vein in an equable manner; but if the lode has any declivity near it, then many of the looſe ſtones of the broil are found ſtrewed down the hill. See Plate XVII. Fig. VIII. M N O.

Secondly, The longer the declivity, the farther are theſe ſtones removed; but the ſhorter and ſteeper the ſides of the hill are, the leſs diſtant they are found.

Thirdly, The ſmaller ſtones are carried fartheſt; on the contrary, the largeſt ſtones are neareſt to the lode.

Fourthly, The ſmaller are alſo nearer to the ſurface of the ground, but the larger ones, deeper, and ſtill deeper as you approach the lode, till the laſt are found contiguous to the lode itſelf. See Plate XVII. G, B, H. Fig. VII.

Fifthly, The farther diſtant theſe ſtones are from the lode, the fewer they are in number; but they multiply as you come nearer, and are always in greateſt plenty next the lode.

Sixthly, Theſe ſtones are known from all others by their being of a different colour and ſtructure from the ſhelf, rubble, and other common ſtones of the ground where they lie, but more particularly by their angles being worn off; and the farther diſtant they are from the lode, the ſmoother they are; and the nearer, the leſs are their angles blunted. In Cornwall we call theſe diſperſed parts of the broil Shodes [b]. See Plate XVII. Fig. VIII.

SECT. IV. Whence the Properties of ſhodes.

From daily obſerving the grounds they ſearch, and the different ſubſtances they there meet with, the tinners can readily diſtinguiſh

[a] "Loads uſually covered with rubble and fragments caſt upon the veins by the hurry of water," viz. of the deluge. Hutchinſon's Tracts, vol. I. tract ii. page 3.

[b] Perhaps from the Teutonic word Shutten, to pour forth.

between what has been removed, from what has perpetually kept one and the ſame ſtation; the karn, that is the firm ſolid rock, ſeldom affords us any inſtances of alteration or movement, but every looſe unconnected part of the earth has been moved and ſhifted; and foraſmuch as the tranſpoſed bodies are found to be moved more or leſs, farther or leſs diſtant from their former beds, according to their own ſpecific weight, and the declination of the plane they moved on, it is the general perſuaſion of every intelligent tinner, that this change of ſituation can be owing to nothing but the force of water, and of no other water ſo likely as that of the univerſal deluge: neither are we to think this leſs the voice of truth, becauſe it is ſo common an opinion; for indeed the cauſe ſpeaks ſo much for itſelf, that in order to confirm the juſtneſs of this reaſoning, there remains nothing more to do, than to point out the correſpondence and circumſtantial agreement betwixt this aſſigned cauſe, and each particular effect and property mentioned before.

Firſt then, In low and level grounds the broil is greater in quantity and leſs diſturbed than on the tops or ſides of hills, as being but juſt moved from its firſt ſettlement by the vacillating waters of the deluge on a plane ſurface; whereas on a declivity, and a more expoſed ſituation, the waters had more power to agitate and diſperſe, and conſequently the original covering of the lode is much leſſened in quantity.

Secondly, The gravitation of theſe ſtones (uſually impregnated with metal) will, when moved with water, make them deſcend a ſteep hill quicker than down a more eaſy deſcent, in the ſame proportion as bodies moved on inclined planes, their velocity being in proportion to their own weight, the declivity on which they move, and the impediments they meet with there; but the quicker they deſcend, the ſooner they get at reſt, and fix by immerging themſelves in the ſtiff clay and rubble, and *vice verſâ*.

Thirdly, The ſmaller ſhodes were moved to and fro eaſily and frequently, and conſequently much diſperſed; whereas the greater and weightier the ſhodes were, the more they reſiſted the agitation of the waters, and were leſs removed.

Fourthly, The ſmaller ſhodes are uſually found in and near the ſurface, being waſhed downwards, till, by the reſiſtance of the ground on which they are ſpread, they are forced out like the rills of brooks into open day, whilſt the larger, by their ſuperiour weight, reſt deeper interred, and nearer the lode.

Fifthly, The more diſtant ſhodes are found from the lode, the more they were diſperſed by the water, and conſequently became fewer in number in any equal ſpace, like diverging rays; and the nearer to the lode, the thicker and more frequent they remain for the ſame reaſon. See Pl. XVII. Fig. VIII. Sixthly,

Sixthly, That the angles of theſe ſtones are blunted, proceeds evidently from the agitation of water, and they are ſmoothed in proportion to the diſtance they have been rolled; and had the force continued a ſufficient while, theſe ſtones would have been as round as the pebbles on the ſea-ſhore; but the farther we find them from the lode, the more trituration they have undergone, and *vice verſâ*.

It may be here objected, that if the deluge ſmoothed off the angles of theſe ſhodes, why had it not the ſame effect upon the looſe parts of the killas, granite, marble, and other ſtones with which theſe ſhodes are intermixed? The reaſon ſeems to be this: The long, flattiſh, light, and ſharp-angled parts of the broil continued their former ſituation on the top of the lode; they could not but be waſhed, yet they were not detached: thoſe parts only of the broil which were ſtony nodules, impregnated with metals and minerals, upon every agitation rolled, and fell with forces in proportion to their weight; whereas lighter and flatter ſtones moved with leſs violence, and ſuffered little as to their extremities. This was the caſe in general; but where declivities were long rather than ſteep, and many little vallies concurred and diſcharged their contents, there, the force of the waters being increaſed, not only the tin-ſhodes are much rounded, but the granite and killas nodules; and every kind of ſtone, from a foot diameter and under, is rounded into a pebble-like form, as well as the tin, as any one may ſatisfy himſelf by obſerving the *ſtrata* of rounded ſtones in the ſtream-works of St. Auſtel moor. Shodes therefore are not always metallic; they are ſometimes barren. One thing more may be here obſerved, which is, that the broil is ſeldom ſo well impregnated as the lode underneath; the reaſon I take to be this: The broil, being more looſe and ſhattery than the lode, has had much of its tin waſhed away by floods, whereas the metal of the lode lay more ſecure from ſuch diſſipation. Again: The broil being in poſition above the walls of the fiſſures, had no depth of *ſtratum* to draw the metallic particles from, had no chinks or collateral crevices for the waters to communicate the treaſures of the adjoining *ſtrata*, nor fiſſure to lodge and detain them: this is alſo the reaſon that the upper parts of the lode itſelf are ſeldom ſo well impregnated as thoſe parts which lie deeper in the ſame vein, inſomuch, that it is a common rule with the miners to ſink upon lodes which are poor, it being generally found, that lodes prove richer in depth, than near the ſurface.

From the top or broil, let us deſcend, and take notice of the moſt remarkable properties of the body of the lode.

SECT. V. Of the body of the lode.

The

Its contents. The lode is either barren or impregnated. Many of our lodes in Cornwall are happily ſtocked with plenty of metals, but the richeſt are not equally impregnated in all parts, and numbers of lodes have nothing metallic in them: there is nothing conſtantly uniform in the bowels of the earth; metals are not more differently diſtributed among climates and countries than they are oftentimes diſpoſed in different parts of the ſame mine. Hence ariſes great uncertainty and frequent loſs in mining, the certain gain even here in Cornwall, where metals are in ſuch plenty, being only the maintenance and conſtant employment of the labourers and artificers depending on the mines, and the conſumption of materials which bring in a conſiderable revenue to the publick whether the adventurers gain or loſe.

The lode is not ſo often two feet wide and more, as it is one foot and under; ſometimes however it is wider, but, generally ſpeaking, the ſmaller the lode the better impregnated [c].

Lodes either conſiſt of hard, ſolid ſtone, or are leſs compact, ſoft, and crumbly. If the adjoining *ſtrata* have yielded plenty of liquid ſpar and cryſtal to incruſt the metallic particles, then the tin or other metal is found incloſed in ſolid, hard, ſtony ſubſtance; but where nature has been more ſparing of her cement, the ore is found in a lax, arenaceous, and rubbly ſtate: both hard and ſoft lodes may be well and equally impregnated, but ſoft lodes are more apt to have their metals diſperſed.

SECT. VI. The Inclination and fracture of the lode, and their cauſe.

Lodes are ſeldom perpendicular; they decline as they deſcend, either to the right hand or to the left, but in very different degrees; and the ſame lode may decline in one part to one ſide of the perpendicular, aud in another part to the oppoſite ſide. This declination increaſes as it approaches the ſides of hills, and the cliffs of the ſea-ſhore, of vallies and of rivers; but the ſame lode which ſhelves away quick at the declivity of a hill, or the approach of a precipice, when it gets upon a champaign plain ground, coaſts it almoſt upright. Again: Lodes are not only inclined but fractured, and the inclined fragments found ſeparated from each other by the intervention of earth ſtone, or both, entirely different from the lode; from whence it follows, firſt, that ſuch lodes were formed before the fracture; ſecondly, that as the fracture muſt have been the effect of violence, and probably of a violent agitation, the inclination muſt have been alſo the effect of force, although in many inſtances that force only bent, and did not proceed to that degree of violence as to occaſion a diſrupture of the lode; thirdly, the firſt direction

[c] In the pariſh of St. Juſt (Penwith) the lodes are ſeldom wide, but the tin is of the beſt kind.

of

of the lode was the perpendicular, or nearly ſo, and the inclination and fractures are but two different degrees of variation from it. If therefore we can diſcover the probable cauſe of the inclination of lodes, the ſame cauſe, allowing it but a greater impetus, will account for the fracture. Now betwixt the inclination of lodes, and the dippings of the adjoining *ſtrata*, there is oftentimes (tho' not always) ſo manifeſt an agreement and correſpondence, that whatever occaſioned the latter could not but produce the former. Let us firſt note the dippings of the *ſtrata*; for if they have alſo been wreſted, the lodes contained in them could not have preſerved their ſtation. As the original poſition of lodes was perpendicular, that of the *ſtrata* was horizontal, each layer of ſtone, earth, ſand, gravel, and their commixtures, reſting (for the moſt part) according to their different gravitations, and ſpreading in belts and floors nearly parallel to the ſurface of the earth; but we often find theſe *ſtrata* very ſenſibly declined from that, their firſt poſition; nay ſometimes quite reverſed, and changed into perpendicular. Thus, for inſtance, the rocks and ledges on each ſide of large rivers, laid bare by tides, are frequently obſerved to turn their points and thin edges down towards the chanel, intimating, that, from horizontal, they have dipped forward towards each other, making an angle in the middle, in which the waters paſs, as in Plate XVII. Fig. 1. page 149. Again: In ſinking on the ſides and bottom of vallies, we find the natural rock or karn, G, H, F. (Fig. 11. ibid.) equally covered with earth and rubble, and running nearly in a plane parallel to the ſurface of the ground. For inſtance, at the hill, E, the karn ſhall be ten feet under the ſurface; in the bottom C, it ſhall be ſomewhat deeper, that is, more covered by what is waſhed off from the ſides; and as it coaſts upwards again to the hill D, it ſhall be buried only ten feet again, as at F. Now the lode which croſſes ſuch vallies, riſes and falls, as the karn G, M, H, which cannot therefore be the natural firſt ſite either of karn or lode; for it is utterly impoſſible, that any fiſſure, being an open chanel, could contain in its ſides M, L, K, any liquid (which all lodes muſt at firſt have been) if they were formed in ſuch a curve-line; as much as that a ſyphon, if the tube was ſlit and open on one ſide, ſhould draw water: this obſervation therefore will lead us to this further truth, that the ſubſidence of ſuch vallies muſt have happened ſince the formation of lodes, and that the *ſtrata*, in many inſtances, have departed from their primary poſition; which was to be ſhewn. But the *ſtrata* have not only dipped in ſome places leſs, in ſome more, but from horizontal have become perpendicular. Now, when we ſee a wall lean, we conclude immediately that the foundation has given way according to the angle which the wall makes with the horizon; and

when we find the like declination in the *ſtrata*, I ſhould think we may conclude, by parity of reaſon, that there has been a like failure of what ſupported them, in proportion to that declination.

That we may trace theſe dippings through their ſeveral ſtages, let us ſuppoſe A and B (Plate XVII. Fig. VI.) two *ſtrata* of clay or ſtone under the ſurface, N; if the ground gives way below, from R Q to S I, theſe *ſtrata* ſhall ſink into the poſition of C D; a declivity often ſeen on the ſea-ſhores and the banks of rivers: if the ſubſidence be greater, reaching to L O, making with the horizon an angle of 45° (as in many ſteep ſides of vallies we may obſerve) then A B ſhall deſcend and become E F; but if the ground recedes at M P, as well as falls, an utter ſubverſion enſues, and A B ſhall become G H; that is, the *ſtrata* from horizontal become perpendicular [d]: on the other hand, if the ſubſidence under the *ſtrata* A and B, be in the direction of S, I, O, then ſhall A B become T U, a poſition often to be ſeen in large inclined maſſes of cliffs on the edge of the ſea [e].

If the *ſtrata* then, in which the lodes are found, have departed from their original poſition, it is no wonder that lodes ſhould partake of the ſame alteration; for whatever wreſted the *ſtrata*, muſt have proportionably affected the contents of ſuch *ſtrata*. Let us ſee whether the fact anſwers the theory.

In the vicarage ground of St. Juſt (Penwith) there is a tin-lode, to the north of which there is a valley, as C, Plate XVII. Fig. II. accordingly the lode A B dips away towards this valley in the top, and underlies (as the tinners expreſs it) into the hill D; that is, ſhoots away from A to B.

In a tin-mine in Roſmerguy cliff, in the pariſh of Morvah, the lode near the brim of the cliff, A B, Plate XVII. Fig. III. underlies ten feet in ſix perpendicular; but this great and unuſual dipping (for, if the lode varies from a perpendicular five feet in twenty, we generally reckon it a great underlying) grows leſs and leſs, that is, the lode approaches more and more towards a perpendicular line as it runs farther into the hill, ſo that when you come inwards from the cliff about one hundred fathom, and as deep as C D, Fig. III. (above which the ground is level and champaign, as M L) the ſame lode becomes perpendicular, as D F.

This remarkable relation of inclined lodes to the next adjacent depreſſion of the earth's ſurface (which might be confirmed by many other inſtances) will naturally lead us to conclude, that whatever made the *ſtrata* fall ſo much awry, muſt alſo cauſe every thing included in thoſe *ſtrata* to fall proportionably.

[d] This is the ſurprizing preſent ſituation of the ſtrata of Caldy Iſland in Pembrokeſhire, deſervedly taken notice of by Mr. Hutchinſon, Tracts, vol. I. page 27, Edit. 2.

[e] See O S H, Fig. III. ib.

Suppoſe,

Suppoſe, for inſtance, T V W S (Fig. IV. Plate XVII.) a ſmall iſland with four lodes A B, G H, I K, N O, running eaſt and weſt through it. In the middle, where there has been no extraordinary ſecondary ſubſidence, (by which I mean a ſubſidence ſince the firſt diviſion of ſolids and fluids at the time of the creation) the lode, G H, ſhall keep its natural perpendicular direction, and the *ſtrata* lie on each other in their horizontal uſual manner; but ſubſidences and diſlocations of the *ſtrata* having happened near the edges or cliffs of this iſland, (as may be obſerved more or leſs in almoſt all cliffs) the lodes which run near the extremities, ſhall be variouſly affected. Suppoſe a lode, A B, in its original perpendicular poſition; a ſubſidence of the *ſtrata* happening underneath, the *ſtratum*, E D, ſinks and becomes D F, then ſhall the lode, A D, ſubſide alſo, and become C D, the inclination tending towards the general fall of the ground at T; but if there be a lode on the other ſide of the iſland, as I K, where the dipping has been in a quite contrary direction, and the *ſtratum*, K L, dips ſo as to become K M, then ſhall the lode, I K, become inclined, as X K. If farther on, and nearer the edge of the cliff, at S, there be a greater dip of the the under *ſtrata*, as from O Q to O R, then will the adjoining lode, N O, become inclined, as O P, and ſo proportionable to the dip of the *ſtrata*, ſhall be the inclination of lodes.

SECT. VII. The uniformity of lodes in particular diſtricts.

Again: Where theſe ſubſidences below were extenſive, and have affected large tracts of ground, there is a certain uniformity in the inclination of lodes; as, for inſtance, in ſome pariſhes in the weſtern parts of Cornwall (as in St. Juſt) we generally find the lodes underlying towards the ſouth; but in the pariſhes of Gulval and Lannant, (the firſt about ſeven, the other ten miles from St. Juſt) they dip to the north as often as to the ſouth, according as the ſubſidence prevailed. Where-ever the greateſt ſubſidence was to the north of ſuch tracts, the tops of the lodes would conſequently point to the north, (as Plate XVII. Fig. III. A B to C) and the lodes themſelves underlye to the ſouth; and this uniformity would take place, notwithſtanding the leſſer dippings of vallies and low grounds in ſuch diſtricts; for it muſt be obſerved, that vallies might in ſome meaſure diminiſh or vary, but could not always wholly controul or prevent the general tendency of ſuch large maſſes falling with ſo powerful a *momentum*.

SECT. VIII. The irregularity of this inclination

Again: Many vallies and depreſſions were the conſequences of the firſt ſettlement of ſolids, and were therefore formed before the lodes themſelves: it is no wonder therefore if we ſee lodes inclining ſometimes without any regard to the declivity of ſuch primæval depreſſions,

depreſſions, foraſmuch as the lodes muſt owe their inclination to diſtinct and poſteriour ſubſidences produced by a cauſe which we ſhall by-and-by enquire into. Another reaſon of ſome irregularities, is, that no ſubſidence could equally affect all the adjacent parts of ſo mixed a maſs as the inteſtines of the earth are, nor all parts moved ſettle again in one direction; from the texture of the earth, I ſay, it could not happen, but that the inclinations would be greater in one place than in another, nay ſome quite contrary to others; and the fact is agreeable to the reaſoning; for we ſometimes find two adjoining lodes of a quite oppoſite inclination, *viz.* one underlies to the ſouth, as C D, Fig. IV. Plate XVII. the other, not twenty fathoms diſtant, ſhall underlye to the north, as Y Z, till both meet and unite at D, as in the mine called Huel-oules in St. Juſt. Such lodes will ſometimes croſs each other, as C, D, *a*, Y, D, Z, ibid. (as they do at Bartiny hill in St. Juſt) plain evidences that they proceeded from ſubſidences on the different ſides of the lodes, *viz.* C D *a* from a ſubſidence at *a* Z *b*, and Y D Z from a ſubſidence at Z *a c*. Here is alſo plain evidence that theſe different ſubſidences happened at different times, for one lode deſcends in full body through the other: when they croſs in ſuch a manner, it is not eaſy to decide which of the two lodes was firſt formed. Mr. Hutchinſon, in his Tracts of the Corniſh lodes, page 19 and 20, thinks that theſe lodes which croſs, (that is, run north and ſouth) and run in full body through the main lodes, (which run eaſt and weſt) were formed after the main lodes, which, by cracking, gave way for the croſs-lodes to paſs through them, an ingenious ſuppoſition, and moſt likely in general to be true; but much will depend upon examining the inward ſtructure of theſe lodes; if that ſtructure is uniform throughout in each, and different from that of the other, then Mr. Hutchinſon's ſolution is right, and that which is cracked muſt have been prior to the other; but if at the point of interſection, D, both lodes have nearly an equal mixture of the ſame feeders, ſtone, clay, or ore, then were the fiſſures inclined probably, and became replete at one and the ſame time, and filled with one common matter.

SECT. IX. Different ſubſidences proved from fractured lodes.

But that there have been different ſubſidences, and at different times, will ſtill be more convincing, from another remarkable poſition in which we ſometimes find our Corniſh lodes.

In a mine called the North-Downs (a conſiderable mine of tin and copper near Redruth) when they find the tin-lode quite worked out at the bottom, and no farther appearance of a lode, either dead or alive, (that is, impregnated or not) with or without walls; inſtead of ſinking any farther, they drive acroſs, and at a ſmall diſtance

diſtance find a part of the ſame natured tin-lode as they worked before, and in the ſame direction. When the parts of the ſame lode are found thus ſeparated from each other, the tinner's expreſſion is, that the lode is heaved or ſtarted; and, as much may depend on the reader's clearly apprehending what is here meant, let us recur to the explanation of figures. Let A B (Fig. v. Plate XVII.) be the lode firſt wrought; the miners ſinking till they come to B, there find no more lode; they ſink a little farther in the direction A B, but to no purpoſe; gueſſing then from their experience in like caſes that the lode is heaved, or, more properly ſpeaking, ſtarted, they let alone the bottom B, and drive a level paſſage or drift to C; there, to their comfort, they find a part of the former lode C D; and having worked it down to D, where it diſappears, they drive again acroſs to E, and ſo work it down to F, or as far as it goes; and when they find it no more in that direction, repeat the ſame ſearch to as good purpoſe as before, ſo that experienced workmen can tell nearly at what diſtance, and in what place, the ſtarted lode is ſurely to be found.

In the lands of Kelluz, in St. Erth, the lode is ſtarted to the north twenty-five fathoms; but this is looked upon as very extraordinary: the ſame fractures are obſerved in the coal-mines, where there are ſometimes, though rarely, three dippings, (as Dr. Plot, Staffordſhire, page 130, ſays) and the coal is ſaid to leap: the colliers alſo from experience know where to find it again.

Now in this remarkable phænomenon, it firſt appears, that A B, C D, E F, are ſo many ſeparate portions of the ſame lode; for they conſiſt of the ſame *pabula*, the ſame metal, and make nearly the ſame angle with the horizon, and abruptly and equally vaniſh; being broken off at B D F, at one and the ſame diſtance nearly they appear again; all irrefragable evidences that they are not different lodes, but each a diſtinct *fruſtum* of the ſame lode.

Secondly, That this lode was formed before the fiſſure which contains it became inclined and fractured in this manner; for B was joined to C, and D to E, whereas now they are at a diſtance.

Thirdly, That there muſt have been three ſucceſſive different ſhocks which could create three ſuch fractures.

Let us ſee therefore whether the ſubſidence of the *ſtrata*, the cauſe before aſſigned for the dippings of the lodes, will naturally account alſo for this their very ſingular disjointed ſtate.

SECT. X. Cauſe of fractured lodes.

Firſt then, from theſe and ſeveral other apparent alterations in the bowels of the earth, it is highly probable, that the *ſtrata* were not only unfooted, ſhaken, and brought to fall, once only, or twice, but ſeveral times. Suppoſing then the lode N F (Plate XVII. Fig. v.)

in its original perpendicular poſition, and M F a *ſtratum* ſpread on any precarious foundation to give way and deſcend to R L F, then will the lode N F deſcend alſo, and become O E F. A piece of the ſame *ſtratum*, R L, is afterwards unfooted, and becomes S I K, then will the lode, O E, fall in proportion, and become P C D. Another ſubſidence happens from like concurrent cauſes, and S I ſhall become G H; then ſhall that portion of the lode, P C, fall into the poſition of A B, and, in proportion to the times and falls of the under *ſtrata*, ſhall the lodes deſcend either in whole or in part. It may be ſaid, that if theſe ſubſidences were the cauſes of the above-mentioned fractures, then the interſtices of ſuch broken lodes would be filled by earth, clay, gravel, and ſuch looſe materials, as the diſordered *ſtrata* could not but throw into the opened crevices; this is very true, and the matter of fact confirms the ſpeculation; for between B and C, D and E, (ibid.) a ſhelving ſoft congeries of rubble, clay, ſand, or the like, (by the Corniſh called a Flookan) is interpoſed: it is of a different ſubſtance from the lode and wall of the fiſſure, and by the vulgar is thought the cauſe of the lode's being ſtarted; but is indeed the effect, and nothing more than the depoſite of the adjoining grounds after the fracture of the lode had been made.

SECT. XI. Cauſe of the ſubſidence of the ſtrata.

As we have endeavoured to ſhew that the ſubſidences of the *ſtrata* were the cauſe of the inclination and fracture of lodes, it cannot be improper to hint at the date and cauſe of theſe ſubſidences.

It has been obſerved before, (page 80) that, at the firſt induration of bodies, it was impoſſible, but that the ſurface of our globe ſhould be higher in ſome parts, and lower in the reſt; that the earth, porous and cavernous as it muſt be by the intermixture of ſubſtances apt to give way, ferment, and explode, muſt ſink deep in ſome places, and leſs, or not at all, in other places. Now, as we owe the mountainous and hilly parts of our globe to the ſolids which ſtood firm and prominent, ſo to theſe depreſſions of the more lax and cavernous parts we owe the bed of the ocean, and the ſubſidence of vallies; but theſe depreſſions, ſo neceſſary, (the leſſer to conduct the rivers, and the greater to contain and form the ſea) could not but influence more or leſs all the adjoining *ſtrata*, and the *ſtrata* all their fiſſures and lodes; hence ſo manifeſt a relation in many parts to theſe firſt and principal depreſſions.

Secondly, When the ſea was formed, its ſearching fluctuating waters waſhed and exhauſted the looſer ſubſtances from betwixt the *ſtrata*, and time occaſioned many ſubſidences of the higher upon the lower *ſtrata*, which ſubſidences muſt have been in ſize and tendency according to the ſhape and dimenſions of the vacancies from

from which ſuch looſe ſubſtances were educed, and not to their ſituation with regard to the ſea. To theſe ſecondary ſubſidences we may aſcribe irregular and contrary inclinations of our lodes.

Thirdly, When it was determined that an univerſal deluge ſhould deſtroy all terreſtrial animals, excepting only a ſmall number preſerved in order to reſtore the ſeveral ſpecies: to produce this deluge, the ſea moſt probably was the chief inſtrument; its bottom inflated, and raiſed ſo as to throw its waters over the higheſt mountains, covering them as a garment. When the Divine Juſtice was ſatisfied, the bottom of the ſea returned nearly to its former level, yet not ſo exactly [c], but that it left ſome parts above the ſea (now iſlands or hills) which were before part of the ocean's bed; the *ſtrata* of thoſe parts were therefore greatly disjointed, ſome inclining one way, ſome another, ſome quite reverſed. To this dreadful cataſtrophe are we to attribute many irregularities of the *ſtrata*, which have no correſpondence or the leaſt relation to the primary ſubſidences.

But whatever was the inſtrumental cauſe of the deluge, that there has been a deluge is the united voice of tradition, of Scripture, and of nature; and from fact it appears, that this deluge diſſolved all clays, earths, ſalts, and the ſofter ſtones, and muſt have occaſioned great ebullitions and exploſions among the pyrites, ſalts, and ſulphurs, where-ever its waters pierced; and hence happened very conſiderable ſubſidences in the protuberant parts of our globe, where the ſea never before reached ſo as to affect the *ſtrata*.

Laſtly, a few ſubſidences may have happened ſince the deluge, from the ſame exhauſting diſſolvent powers of water, inundations, or by the force of earthquakes, but none could happen either firſt or laſt, from whatever cauſe, or at whatever time, without altering the ſituation of all ſolids within their reach, in proportion to the force with which they acted upon the adjacent grounds.

CHAP. XV.

Of Metals found in Cornwall; and firſt of Tin.

HAVING examined the fiſſures and the lodes, and their ſeveral properties moſt worthy of notice, we muſt proceed in the next place to the metals which our Corniſh lodes contain.

Of metals Tin is the lighteſt, and therefore ſhould be the firſt in our ſcale, if there were no other reaſon than the uſual method of ranging metals according to their ſpecific gravity; but tin would otherwiſe deſerve the firſt notice here, becauſe it is in a manner the peculiar

[c] See page 78.

peculiar and moſt valuable property of this county, creating at home employment and ſubſiſtence to the poor, affluence to the lords of the ſoil, a conſiderable annual revenue to our Prince the Duke of Cornwall, and demanded with great eagerneſs by all the foreign markets of the known world.

SECT. I. Tin, where found.

How anciently tin has been raiſed in Cornwall cannot be preciſely determined, but this county and Scilly iſles (nine leagues diſtant from it to the weſt) were traded to for tin by the Phœnician colonies of Spain ſeveral hundred years before Chriſt. The Grecians and Romans, as ſoon as they applied themſelves to marine expeditions, ſtudiouſly inſinuated themſelves into the ſame traffick. Some tin was formerly found in Gallicia and Luſitania, but this ſeems to have been little in quantity, in an arenaceous ſtate, with a few ſhodes intermixed [f].

To Cornwall therefore the commerce for tin principally tended, and here ſolely continued till about the middle of the thirteenth century after Chriſt, when a tinner of this county, being diſobliged by Richard Earl of Cornwall King of the Romans, went into Germany, found the ſame metal, and taught the Saxons how to diſtinguiſh, ſearch for, and dreſs their tin; and in Saxony, and ſome other places, there are at preſent ſuch workings as ſupply ſome of thoſe inland parts; but the quantity is ſmall, and the expence of raiſing, and carrying it by land, is great. On the coaſt of Malabar, in the Eaſt Indies, ſome tin has been diſcovered of late years, and brought into Europe. Alonzo Barba [g] tells us, that, in the Spaniſh Weſt Indies, tin is diſcovered in ſeveral places, but the working of it neglected, becauſe of the neighbourhood of richer metals; but the tin of Cornwall is ſuperiour in quantity and quality, and facility of exportation, to that of all the reſt of the world [h].

SECT. II. Several ſtates in which tin is found.

Tin is found either collected and fixed, or looſe and detached. In the firſt caſe, it is either accumulated in a lode, or in a floor, or interſperſed in grains and bunches in the natural rock; in the ſecond and more diſperſed ſtate, it is found either in ſingle ſeparate ſtones, called Shodes, or in a continued courſe of ſuch ſtones, called the Beuheyl; or, laſtly, in an arenaceous pulverized ſtate. Of which in their order.

SECT. III. In the floor.

The fiſſure and the lode have been already explained (chap^{s}. xiii and xiv.) The floor is a horizontal layer of ore. Mr. Hutchinſon, ſent into Cornwall by Mr. Auditor Harley and Dr. Woodward in ſearch of

[f] Pliny, lib. xxxiv. chap. xvi.
[g] Engliſh tranſlation, page 91, 92.
[h] Woodward's Method of Foſſils, page 52. Cat. vol. I. page 5.

foſſils

foſſils [i], found none of this ſort. "I neither ſaw, ſays he [k], nor could learn upon enquiry, that there was either pipe, float, or belly of ore in Cornwall," yet ſuch there are, and in ſeveral places; indeed tin is not ſo often found in this poſition as in a lode, the ſame ſubſtance which fills the fiſſure, and there concretes into a wedge-like form, not meeting with ſo many horizontal as perpendicular cavities for it to reſt in. The floors are found at the depth of many fathom, and ſometimes very rich, as were Bal-an-uûn, in the pariſh of Lannant, and Huêl-grouan, in the pariſh of Breâg; and the ſame ore ſhall be ſometimes in a perpendicular lode for ſeveral fathoms, and yet in depth diffuſe itſelf into a floor. Where theſe floors are, the mines are ordinarily more dangerous, as well as expenſive than others, the largeſt and ſtrongeſt timbers being required to ſecure the ſeveral paſſages of the mine, and great care muſt be taken that ſupporters, though of the richeſt tin, be left untouched at proper intervals; for want of this caution (which never ſhould give place to gain) the ground at Bal-an-uûn before-mentioned, for a large compaſs, and without any previous notice, ſunk down-right a few years ſince, and buried all the men below, and all above within reach of the fatal circle.

SECT. IV. In ſpots.

Tin-ore is alſo found diſperſed in ſpots and bunches in the body of the ſtone, where there appears no fiſſure, lode, floor, or rectangular interſections, as in other *ſtrata*. Theſe ſpots are ſometimes ſo large and numerous when in granite, (as in Trevegeon in St. Juſt) that they well requite the labour of the tinner, though he is generally obliged to blaſt the rock, and afterwards break it with ſledges, in order to get at the tin.

If theſe ſpots be in the blue Elvan ſtone (as we find them near the Land's End) no iron will pierce the ſtone, neither can it be blaſted with gunpowder.

SECT. V. In ſhode and ſtream.

Tin is alſo found diſſeminated on the ſides of hills in ſingle ſtones, which we call Shodes, (as is before obſerved) ſometimes a furlong or more diſtant from their lodes, and ſometimes theſe looſe ſtones are found together in great numbers, making one continued courſe from one to ten feet deep, which we call a Stream; and when there is a good quantity of tin in it, the tinners call it, in the Corniſh tongue, Beuheyl, or a *Living ſtream*; that is, a courſe of ſtones impregnated with tin [l]. In like manner, when the ſtone has a ſmall appearance of tin, they ſay it is juſt alive; when no metal, it is ſaid to be dead; and the rubble which contain no metal, is

[i] Woodward's Method of Foſſils, page 55.
[k] Tracts, vol. I. octavo, tract ii. page 1.
[l] See I K, Plate XVII. Fig. VIII. page 149.

called deads. Theſe ſtreams are of different breadths, ſeldom leſs than a fathom, oftentimes ſcattered, thongh in different quantities, over the whole width of the moor, bottom, or valley, in which they are found; and when ſeveral ſuch ſtreams meet, they oftentimes make a very rich floor of tin, one ſtream proving as it were a magnet to the metal of the other.

In the tenement of Douran, in the pariſh of St. Juſt, (Penwith) in the year 1738, there was a very ſingular ſtream of tin diſcovered; the ore was pulverized, betwixt one foot and one foot and a half in depth or thickneſs, of various breadth. In the moory ground, where it was firſt diſcovered, it had a back of ſoil and gravel over it, only two feet high, but, as the ſtream advanced farther to the eaſt, it had ſtill a higher covering, till at laſt it had all Douran hill (which may be about forty feet perpendicular) over it, the ſtream continuing ſtill its horizontal poſition.

That this ſtream was collected from the adjacent *ſtrata*, and then ſpread in this equable manner by the force of waters, is extreamly probable; but how it ſhould become covered with ſuch a large heap of rubble, clay, and gravel, as compoſes the hill of Douran, is not ſo eaſy to decide: there are indeed ſtrong proofs, in ſome of the adjoining cliffs, of large heaps, very little inferiour to this in quantity, which were moſt likely laid where we find them by the waters of the deluge. But whether this remarkable poſition of arenaceous tin is owing to the waters of the flood (which indeed is a moſt fertile ſolution of ſubterraneous difficulties, but I fear too often recurred to) may be well queſtioned. It ſeems to me, that wherever there is an horizontal extended vacancy betwixt the *ſtrata*, and at the bottom of that vacancy an even hard floor, either of ſtone, clay, or gravel, into which the waters cannot readily ſink, and lodge their depoſits in chinks and crevices, there the waters will ſpread their contents horizontally. Suppoſe then the *ſtrata* of the hill of Douran to be well impregnated with this arenaceous tin, the waters percolating thro' the hill would by degrees congregate and waſh it forwards till it met with ſuch an horizontal floor as has been mentioned, which the tin, not being able by its weight to penetrate, muſt conſequently ſpread itſelf upon the ſurface in breadth and thickneſs anſwerable to the vacancy which receives it; and this is moſt likely to be the caſe, and may happen under the higheſt and moſt rocky mountains which ſtood unſhocked by the flood, as well as here at Douran under a gentle riſing.

There are ſeveral *ſtreams* of tin in St. Stephen's Branel, St. Ewe, St. Blazy, and other places, but the moſt conſiderable ſtream of tin in Cornwall is that of St. Auſtel moor, which is a narrow valley about a furlong wide, (in ſome places ſomewhat wider) running near

near three miles from the town of St. Auſtel ſouthward to the ſea. On each ſide, and at the head above St. Auſtel are many hills, betwixt which there are little valleys which all diſcharge their waters, and whatever elſe they receive from the higher grounds, into St. Auſtel moor; whence it happens that the ground of this moor is all adventitious for about three fathoms deep, the ſhodes and ſtreams from the hills on each ſide being here collected and ranged into floors, according to their weight, and the ſucceſſive dates of their coming thither. The uppermoſt coat conſiſts of thin layers of earth, clay, and pebbly gravel, about five feet deep; the next *ſtratum* is about ſix feet deep, more ſtony, the ſtones pebbly-formed, with a gravelly ſand intermixed: theſe two coverings being removed, they find great numbers of tin-ſtones from the bigneſs of a gooſe-egg, and ſometimes larger, down to the ſize of the fineſt ſand. The tin is inſerted in a *ſtratum* of looſe ſmoothed ſtones, from a foot diameter downwards to the ſmalleſt pebble. From the preſent ſurface of the ground down to the ſolid rock or karn, is eighteen feet deep at a medium: in the ſolid rock there is no tin. This ſtream-tin is of the pureſt kind, and great part of it, without any other management than being waſhed upon the ſpot, brings 13 parts for twenty at the melting-houſe*. In one of the workings here were lately found, about eight feet under the ſurface, two ſlabs, or ſmall blocks of melted tin, of about twenty-eight pounds weight each, of a ſhape very different from that which for many years has obtained in Cornwall; and as they have no ſtamp on them, probably as old as the time when the Jews had engroſſed the tin manufacture in the time of King John. They have ſemicircular handles or loops to them, as if to ſling and carry them more conveniently on horſe-back: they are much corroded by the ſharp waters in which they have layn, a kind of ruſt or ſcurf-like incruſtation incloſing the tin. Probably there were ſome Jewiſh melting-houſes near the place, and when theſe houſes were plundered and deſtroyed, ſome of the blocks remained in the rubbiſh, and by the floods, which this valley is ſo ſubject to, waſhed downwards, and covered where they were found. Their ſhape and dimenſions may be ſeen Plate XX. Fig. XIX. A is the upper-part, B the under-part of this ancient block of tin.

In the ſtream-works in St. Stephen's Branel, they alſo find now and then ſome ſmall lumps of melted tin, two inches ſquare and under: what I have ſeen of this kind cuts with difficulty, and more harſh and gritty than the common melted tin, owing to this perhaps, that the ancient melters had not then diſcovered how to flux

* Upon delivering twenty pounds of this tin-ore at the melting-houſe, the melter will contract to deliver to the owner's order thirteen pounds of melted tin at the coynage.

their

their tin into the purity and toughneſs of the preſent age. Theſe nodules I look upon alſo as fragments of melted tin ſcattered from the Jewiſh melting-houſes.

SECT. VI. In ſand and ſlime.

Tin is alſo found among the ſlime and ſands of rivers and of the ſea-ſhore, (as in ſome creeks of Falmouth harbour ſeveral lords of the ſoil have lately experienced to their advantage) waſhed down probably from the hills, and reſting in ſuch ſheltered ſituations that the ſea has not power to carry it off. This was probably the firſt poſition in which tin was diſcovered; for טִ֫יט in the Chaldee ſignifies ſlime, mud, or dirt; and when the Phenicians came here, and ſaw this metal in its ſlimy bed, they called it the Mud, by way of eminence, and thence has the name Tin (in Cornubritiſh Stean, in Latin Stannum) proceeded, and is ſtill continued.

Not only creeks and rivers, but ſometimes the open ſea, (as I have ſeen in Mount's Bay) throws in the ſame metal to us in a pulverized ſtate. In ſuch open bays the tin comes probably from ſome lodes, which, lying bare to the ſea, have their upper-parts fretted off, and by ſtorms thrown in among the ſands.

SECT. VII. In what ſenſe tin or other metals grow.

That tin grows, or is formed anew where there was none before, in any other ſenſe than by approximation of like particles moved from one place to another, is, in my humble opinion, a miſtake. That by fortuitous concourſe (for what agency is it that conducts them) ſulphur, quickſilver, or any other principles in different proportions, compreſſed by cold, or evaporated and ſuppled by heat, can be ſo exactly ſorted as to form a metal, ſeems to me altogether as impoſſible as that the types of a printer ſhould become words and ſentences by being caſually thrown together. The parts of metals are indeed variouſly involved, paſs into different nidus's or cements, from malleable and metallic become lapideous, from lapideous again metallic. The ore is tranſlated from one part of the mine to another, and is renewed where it has been exhauſted; the metal is by fire or uſe waſted, diſſipated, and loſt; yet, if it could be recollected, might again become metallic; but tin is no where formed but by the peculiar metallic principles of tin concurring, nor iron but by thoſe of iron. The formation of metals was not left to the accidental occaſional combinations of diſtinct ingredients: their principles and criterions were all created in their proper kind; one metal or mineral may mix with another, and remain diſguiſed for a time, but never changed. Sulphur and quickſilver, and other minerals as well as metals, may have tin in their ſubſtances, and by proper magnets and ſolvents, will doubtleſs diſmiſs that tin, and remain as much ſulphur and quickſilver as they were before; but

ſo

ſo adroit and exact a mixture of any principles in the bowels of the earth, as to conſtitute one peculiar metal unalterably remaining itſelf, and not tranſmutable into any other, ſeems to me inconceiveable, if not impoſſible; the conſtancy, and immutability of metals, muſt be irrefragable arguments of their being created bodies *ſui generis*, diſtinct from each other, and from all other bodies of the univerſe, and of their growing only by *juxta* poſition. However, learned men are of various opinions, and thoſe more eſpecially whoſe profeſſion it is to reſolve bodies into their original principles, and determine the number, ſorts, and quantity of the ingredients which compoſe them [m]. It is true all bodies which come under our obſervation are compounded, but, not to range beyond the ſubject of our preſent enquiry, every metal has its peculiar characteriſtick from which it will not depart, nor change into any other metal; each therefore has ſome diſtinct principle which others have not; for if all metals are but mixtures of the ſame principles in different portions and different degrees of refinement, why will they not by any ſubtraction of fire or ſolvents, or addition made to any one principle, become a leſs refined and inferiour, an intermediate or new, or a more refined and more valuable metal? In other words, why will not tin become lead or ſilver, and gold become copper, and *vice verſâ?*

SECT. VIII. Several ways of ſearching for and diſcovering tin.

Having now conſidered the ſeveral ſtates and ſituations in which tin is found, it muſt be obſerved, that tin does not appear ſo frequently in either or all of them together, but that people are perpetually ſearching after more, and endeavouring to make freſh diſcoveries.

To ſay nothing of dreams and fires by night, motives equally illuſive, though prevalent ſtill among the vulgar, few of the Corniſh have ever heard of the *virgula divinatoria*, and its virtue in diſcovering metallic lodes [n], neither are they often (perhaps not ſo often as they ſhould be) directed by the taſte and colour of waters: the run of a lode is ſometimes diſcovered by the barrenneſs of the ſurface and want or weakneſs of graſs in a particular furrow; thus in the tenement of Trenethick, in St. Agnes pariſh, though the field is cultivated equally in every part, you can diſtinguiſh the courſe of the lode, by the unequal growth of the graſs; this muſt be owing to one of theſe two cauſes, either there is ſo much mineral ſalt below the ſoil, that the roots of plants are parched,

[m] See Agricola de re met. lib. v.

[n] The virgula divinatoria is a ſmall forked hazel wand, which, being carried ſlowly over any area of ground, will bend, it is ſuppoſed, and incline its upper twigs, (by admitting into it's pores the mineral ſteam) in caſe it paſſes over any metallic vein. Some perſons in Germany are ſtill credulous enough to be fond of theſe magical inveſtigations.

or the earth and ſubſtance of the lode is ſo porous, that all the nouriſhment of the manure is diſſipated, and ſinks below, inſtead of being raiſed into the plants.

Much ſurer indications of treaſure are often found in cliffs and caverns, where the lodes, being laid bare for ſome fathoms in depth, may eaſily be examined at its ſeveral ſtages.

Some of the curious will think that diſcoveries may be made by obſerving the poſition and alteration of the ſeveral *ſtrata* as we deſcend in our mines; but there is no ſort of uniformity to be aſſumed in the *ſtrata* of one hill and thoſe of another half a mile off, no relation betwixt the lodes and *ſtrata*, as to depth, width, feeder, length, colour, or texture, and therefore no judgment can be formed from the ſituation of the *ſtrata* in one place, where, how, or in what condition lodes are to be found in another place [o].

In order to make diſcoveries, ſome drive adits [p] or drifts through their grounds, but few can prevail on any fellow-adventurers to bear ſo heavy an expence where the ſucceſs is ſo precarious. It is much eaſier, and leſs expenſive, and therefore moſt common to trace lodes by the ſcattered fragments of them called ſhodes (ſee pag. 149. ſect. iv.); and as this is a kind of ſcience which few tinners underſtand but thoſe who have chiefly applied themſelves to theſe reſearches, it will require more particular notice. If the ſhode is found in the vegetable ſoil, it gives no evidence of any lode's being nigh; but if in the *faſt*, (that is, the rubble or clay never moved ſince the flood) it is taken as a never-failing proof that it came from a lode farther up in the hill. As ſoon as the ſhode is found impregnated with tin, to find the lode it came from is the next care; the proceſs conſiſts in digging pits at a proper diſtance, depth, and in proper direction, and judiciouſly regulating their advances to the lode according as the properties of the ſhodes direct. Firſt, the run of the lode being known to be in the hill above the ſhode, the ſeveral declivities below the hill, and where water may be ſuppoſed to have run with greateſt force, muſt be conſidered, and there, at right angles to ſuch force, muſt the ſhafts [q] be placed croſſing ſuch declivities. For inſtance, let A B, Plate XVII. Fig. VII. page 149, be the ſection of a hill in which there is a lode running eaſt and weſt at C; D is the broil or looſe capping of the lode; S S the outward coat or ſurface of the ground; the ſhodes proceeding from the lode C D, ſhall be found courſing down the declivity of the hill in the direction of G H. Again, Fig. VIII. Plate ibid. gives us the ich-

[o] Something however of ſuch recitals may be ſeen collected by Dr. Woodward, Cat. vol. I. page 201, &c.

[p] Subterraneous paſſages for the water to run off, and for better communication betwixt the ſeveral parts of the mine.

[q] Called, in the Corniſh tongue, Coſteaning-ſhafts, from Cothas-Stean, i. e. fallen or dropt Tin.

nography

nography or plan of the ſame lode and its diſperſed ſhodes; C C is the lode; G H the courſe of the ſhodes: Suppoſe a man at S, on the declivity of the hill to have found a ſhode in the *faſt*, well ſtocked with tin; in order to diſcover the lode whence it came, he ſinks a pit or ſhaft, about ſix feet long and three wide, at L, above the place where the firſt ſhode was found (the pit may be about eight feet deep, more or leſs); and finding a ſhode like to the firſt, he proceeds up the hill to ſink a ſhaft more at M, then at N and O; and if he finds the ſhodes leſs ſmoothed as he advances, growing deeper and in greater plenty than at firſt, he may confidently aſſure himſelf that he is growing nearer and nearer to the lode deſired: finding at laſt at O, that the ſhodes lie as deep as the ſolid karn, he is certain to cut the lode C C in a few paces: if he does not find any ſhodes in the train L M, he begins in another direction, and ſinks a ſide-ſhaft at P, or any place next adjoining, keeping the run of the hill ſtill at right angles, till he finds a ſhode of like ſubſtance to the firſt, and then purſues the lode in the forementioned manner.

SECT. IX. Of bounds and the right for ſearching.

No one in Cornwall can ſearch for tin in this or any other manner, where and when he pleaſes. If the land where the ſhode is found is incloſed and not *bounded*, the leave of the Lord of the Soil muſt be firſt obtained; if the land is bounded, then is the *bounder*'s conſent only neceſſary; but if the land is neither bounded nor incloſed, but a waſtrel or common, then may any one mark out *bounds* there, (obſerving the legal forms) and ſearch for tin. Theſe bounds are the limits of particular portions of ground, containing ſometimes an acre, ſometimes more, but oftentimes leſs; they are little pits dug in the ground about a foot wide and deep, at the extreme angles of certain parcels of land, by drawing ſtraight lines from which, the extent of theſe bounds is determined; in like manner as in geometry, by drawing ſtraight lines from three or four points, the extent of a triangle or quadrangular ſuperficies is known.

SECT. X. Of mining as now practiſed in Cornwall.

The lode being found, three things are neceſſary to be conſidered by the miner; firſt, to diſpoſe of the barren rock and rubble; ſecondly, to diſcharge the water which every lode yields more or leſs, and generally in quantity ſufficient to obſtruct the labourer, if not duly attended to; thirdly, to raiſe the tin; and all theſe are eaſily performed when the workings are near the ſurface; but the difficulties increaſe with the depth, and ſkill and care become ſtill more and more neceſſary, and indeed all the mechanick powers, the moſt forcible engines, and the utmoſt ſagacity of the chief miners,

is

is often too little and vain, where the workings are deep and many. Anciently they worked for tin, (eſpecially when found diſpoſed in floors) by laying open all the ground, as they now do in ſtone-quarries; ſeveral of theſe openings (called Coffens) are ſtill to be ſeen in the pariſh of St. Juſt, and elſewhere; but this being a method too operoſe and expenſive, it was not long, we may imagine, before the tinners learned to make paſſages into the bowels of the earth, of dimenſions no more than neceſſary to examine the lodes, and bring off the ore; and this is what is properly called mining.

The arts neceſſary to mining are many, and every mine almoſt requires a peculiar management: mining therefore muſt be learned by practiſe, by experience, and maſters; not from books, the rules of which, though ever ſo juſt, muſt be frequently ſuſpended, altered, qualified, and ſuperſeded, according as the various circumſtances require. Rather than attempt any directions, I chuſe to give a deſcription of one conſiderable mine from an actual meaſurement, intending that the reader may have a clear notion of the manner in which our Corniſh mines are at preſent carried on.

SECT. XI. Explanation of Pl. XVIII. in the following page.

Fig. I. is the ſection of the pool-mine, exhibiting its ſeveral parts, and the underground workings.

A, black-ore ſhaft; B, houſe ſhaft; C, fire-engine, ſouth front; D, North-houſe ſhaft; E, Little North-houſe ſhaft; F, Penhelic-houſe ſhaft; G, Water-Whim ſhaft; H, Roſkeer ſhaft; I I I, the main adit, or principal drain; K, fire-engine ſhaft; L L L, Huel-dudnans lode when firſt diſcovered in ſingle dots; M, Penhelic lode in double dots; N, South-houſe winds; O, hollow cylinders (ſome iron, ſome of braſs) through which the fire-engine, C, draws up the water that it may run off through the adit, I I; P, the ſeveral workings on the ſouth lode, called Huel-dudnans, as they ſtood in the year 1746; Q, a drift to carry the water from the north lode to the bottom of the engine-ſhaft, X, on the ſouth lode; R, bottoms of the great North-houſe on Penhelic lode, dotted; S, a dippa or pit with a force-pump to free the water; T, bottom of Huel-dudnans; V, Pen-helic deep bottom; W, little winds, that is, ſmall ſhafts made from a drift in purſuit of the ore, and leading down to R X, the bottom of the fire-engine ſhaft, from whence the water of the whole mine there gathered together by various drifts and landers, or gutters of wood, is drawn up to the main adit, I; Y, grey-ore ſhaft on the ſouth lode.

Of Fig. II. ibid.

Fig. II. exhibits the plan of the two lodes worked by the pool-mine; *a*, the north or Penhelic lode in dotted lines; *b*, ſouth or Huel-dudnans lode; *c*, black-ore ſhaft; *d*, houſe-ſhaft; *e*, engine-ſhaft, and ſummer-pole ſhaft; *f*, drift for the water of the north-lode;

Section of the Pool-mine in the parish of Illogan, Cornwall, explaind Ch. XV. pa. 168 &c.

Fig. I.

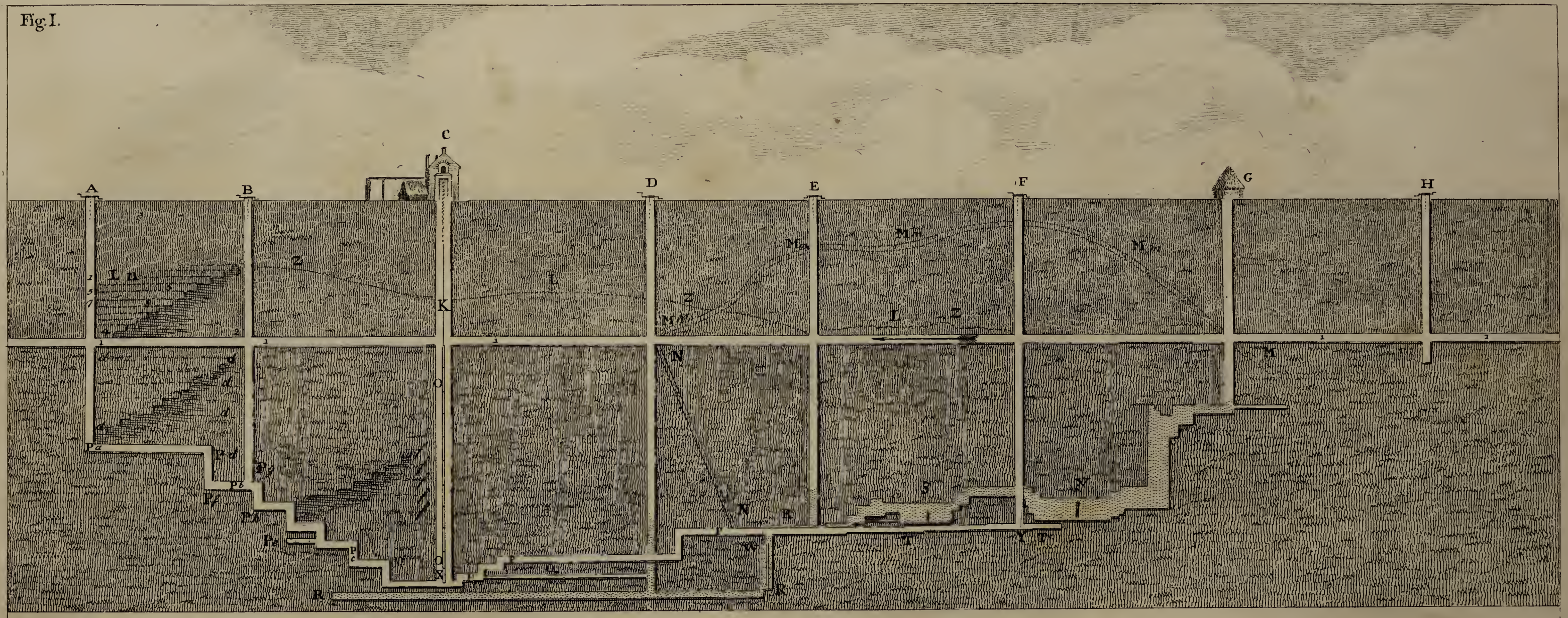
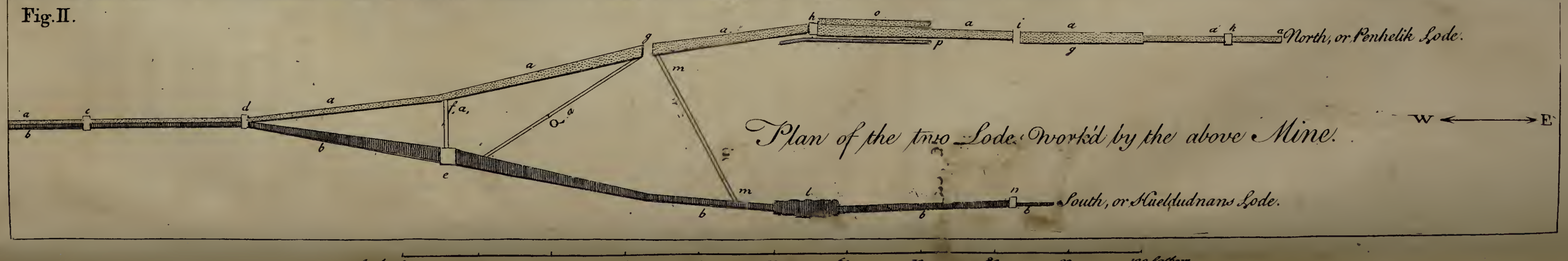


Fig. II.



lode; *g*, North-houſe ſhaft; *h*, Little North-houſe ſhaft; *i*, Penhelic-houſe ſhaft; *k*, water-whim ſhaft; *l*, Huel-dudnans bottoms; the north lode is marked *a a a*, and dotted, the ſouth lode is diſtinguiſhed by perpendicular lines; theſe lodes joining at *a*, keep contiguous from *a* to *d*; then ſeparate, and are of different widths as they advance to the eaſt, and of different diſtances from each other, as in the plan. The reſt of this figure the letters inſerted in the different parts of the ichnography will beſt explain in the ſequel.

SECT. XII. Progreſs of the works.

In Fig. 1. which gives the ſection of theſe lodes, the height of the ſouth lode is known by the crooked line of ſingle dotts at L Z, the different riſings of the north lode are marked with a liſt of double dotts or points at M *m*[r]. There being a very hopeful diſcovery made at L *n*, L Z, and no getting at the riches by reaſon of the water; the adit, I, I, I, twenty fathoms deep, was driven up to the lode from the weſt, and having the two lodes in the ſhaft A at L N, they work with little expence down to the adit I; but finding the lode ſtill rich, they ſink on it down to I P *a*, ſearching the lode to the eaſt and weſt as they deſcend, and bringing away the ore from drift under drift at *d d d*, where the men work in *ſtopes*, that is, in ſeveral degrees or ſteps one above another; the figures 1, 3, 4, ſhew the maſs of ore L N, 4, almoſt exhauſted in this manner, by twelve men working out the lode in twelve ſtopes, at 5, 6, 7, 8. The miners finding the lode to hold the ore no deeper than P *a*, drive to the eaſtward, ſearching the bottom carefully, till, coming to P *d*, they find the ore there to deepen, and purſue it to the depth of P *b*; then drive and ſink alternately as the lode gives encouragement, which in this mine was generally to the eaſtward; but P *e* ſhews that the lode was at that time rich to the weſt, which occaſioned their purſuing it by that receſs. Whilſt one party of tinners was thus engaged in the bottoms, the chief miners (called Captains) took the bearing of the lode with a well-approved needle (which they call dialling the ground), and ſunk another ſhaft at B, as more convenient for getting at the lode at Z, and neceſſary to give air to the workmen, and draw the water, lode, and deads from the workings below at P *b*; and ſometimes there are three ſhafts or more ſinking on the lode at one time. Whilſt the ſhaft B is deſcending to P *b*, the bottoms are carried forward in a ſtep-like manner, whereſoever the lode invites, and the water permits. It will occur to the intelligent reader, that the fiſſure being cleared of ſo much ore, many vacancies in the mine muſt enſue; in theſe vacancies by putting timbers croſs the fiſſure like beams, and laying planks of

[r] Theſe lodes were of copper and very rich, but the way of working tin and copper-lodes in equal circumſtances is the ſame.

fir timber upon them, they diſpoſe conveniently of a great part of the *deads* [s], an œconomy which has two good effects; it ſaves the expence of bringing thoſe deads up to the ſurface, and, by filling the fiſſure at proper intervals, it prevents the adjoining *ſtrata* from preſſing the walls of the fiſſure together, which might otherwiſe be of fatal conſequences. That the common labourers may be employed without confuſion in breaking and raiſing the ore, the captains ſee that they be properly diſpoſed in the ſeveral parts of the mine; that they have neceſſary tools and implements ready provided; they are to examine the ſtate of the mine, and provide for its ſecurity; ſee that the adit be ſound and clear, that the ſhafts, hollows and looſer parts of the mine, be well propped with timber; they are to to ſee that proper communications be made and maintained between the ſeveral works of the mine [t]; more eſpecially are they to inſpect the ores, inſiſt that they may be as ſpeedily broke, as carefully ſeparated from the deads and from each other, and as honeſtly brought up for the owner's uſe, as may be. But indeed their chief care, and what requires their conſtant ſkill and attention, is the management of the water, which in the Corniſh mines is generally very troubleſome, every cranny that is cut throwing forth it's water into the cavity where the miners work. To obviate this inconveniency the captain ſhould be a kind of engineer, and well know how to collect, divert, and conduct, as well as raiſe the water. It is not expected indeed that the captains of mines ſhould know how to build, repair, or rectify the ſeveral engines; for ſuch purpoſes there is a profeſſed undertaker, or engineer, but the captain is to take care that the engineer has immediate notice as ſoon as any thing goes amiſs, that he has proper materials, and without delay attends to remedy the diſorder. In order to this, the water muſt be convey'd over and beſide the paſſages, and croſs the openings of the mine by ſide drifts and gutters, ſo as all that poſſibly can may run off by the common drain I, I; what is below that level muſt be collected and drawn up to the adit. Where there are two lodes (as here, Pl. XVIII.) there muſt be ducts of communication, as *f a*, Q *a*, Fig. 11. which ſerve to convey the water of the north lode into the ciſtern *e*, made in the ſouth lode.

SECT. XIII. Hydraulic engines uſed in Cornwall.

From ſuch ciſterns, judiciouſly placed, the water is raiſed to the adit I, I, ſometimes by large buckets (in the Corniſh tongue called Kibbals) beſt managed by the engine called the Whim, conſiſting of a perpendicular axis, on which turns a large hollow cylinder of timber (called the Cage) round which the rope (being directed down the ſhaft

[s] See horizontal planks from 5 to 6, and from 7 to 8, Fig. 1. L n. Pl. XVIII. [t] See m m, Q a, Fig. 11. ib.

by

by a pulley fixed perpendicularly over the opening of the ſhaft, winds horizontally: this axis has a tranſverſe beam infix'd, at the end of which two horſes faſtened go their rounds, and draw more or leſs according to the number of circumvolutions in any given time, the largeneſs of the barrels, and the depth it is to draw. This is an engine which can only work in a perpendicular ſhaft, if the lode underlies conſiderably it cannot be uſed.

Rag and chain.

Another water-engine which the Corniſh uſe is the *rag and chain*; it conſiſts of an iron chain with knobs of cloth (fenc'd and ſtiffen'd with leather) betwixt two and three feet aſunder; the chain is turned round by a wheel of two or three feet diameter, furniſh'd with iron ſpikes which incloſe and keep ſteady the chain, ſo that it may riſe through a wooden pump of about ſix or eight inches bore, and twelve or fifteen feet long, and by means of the leather knobs bring up with it a ſtream of water anſwerable to the diameter of the pump, and in quantity according to the circumvolutions of the wheel in any given time. This engine is worked uſually by hand, but where plenty of water can be had, as in St. Auſtel moor, much more effectually and frugally by ſmall water-wheels. Several of theſe pumps may be placed parallel upon different ſtages of the mine, as at *p d*, *p f*, *p g*, *p h*, Fig. 1. Pl. XVIII.

Other pumps they have alſo, as the hand-pump, and the force-pump, which like the rag and chain will do well for ſmall depths and little water, and are neceſſary in all *ſumps* [u] and the firſt ſinkings into the lode, before the ſtopes can proceed.

Water-wheel and bobs.

More effectual is the water-wheel and bobs, an engine whoſe power is anſwerable to the diameter of the wheel, and the length of the bobs faſtened to it's axis by large iron cranks; a perpendicular rod of timber to each end of the bobs, works a piſton in a wooden, or (which is far better) a braſs hollow cylinder, and the quantity of water exhauſted will be in proportion to the bore of the cylinder, and the number of times which the piſton moves up and down in any given ſpace.

This is an engine very eligible where a ſufficient quantity of water may be procured, but in ſummer, our ſuperficial water in Cornwall (where we have few great rivers, and our brooks have no long courſe, and the mines are generally on high ground) fails much; ſo that many of theſe engines cannot work from May or June to October; a great hindrance at that ſeaſon of the year when men can labour longer and with more ſpirit than during the other months.

[u] Pits made in the bottom of the mine for the water, or for trying in depth beyond the general workings.

This

SECT. XIV. Of the fire-engine, its power and profit to the public.

The moſt powerful as well as conſtant engine hitherto invented is the fire-engine. This engine is now well known to the learned, but as their books do not reach every where, and this machine is eſpecially ſerviceable for the working of deep mines[x], and of great advantage to the publick revenue, a general explication of it's principal parts, it's powers, and profit to the government, may not be improper. The principal members of this engine are exhibited in the plate annexed, N°. XIX. *viz.* the ciſtern or boiler T, (Fig. 11.) the cylinder P, and the bob O, I, turning on an axis which reſts on the middle of the wall Y. The following is the proceſs of it's ſeveral operations: The ciſtern T, full of boiling water, ſupplies ſteam (by means of an upright tube and valve which ſhuts and opens) to fill the hollow cylinder P, and expel the air through a horizontal tube S, placed at it's bottom: the cylinder, as the ſteam riſes, and the weight of the mine-water depending from I, K, L, preponderates, begins to fill with vapour, and the piſton which plays up and down in the cylinder riſes, and when it is got near the top opens a clack by which cold water is injected and condenſes the vapour into nearly the twelve thouſandth ſpace which it before occupied, and the cylinder being then nearly empty, the piſton of iron edged with tow and covered with water, (to prevent any air from above getting into the cylinder) is driven down by the preſſure of the atmoſphere (with the force of about 17 pounds † on every ſquare ſuperficial inch) nearly to the bottom of the cylinder; at this inſtant it opens the valve which lets in the ſteam from the boiler T, and then the piſton aſcends till it opens the condenſing clack above, which brings it down again to open the under clack and admit the ſteam, and thus continues aſcending and deſcending as long as the managers think proper; this proceſs is quick, or otherwiſe, as the ſteam is by increaſe or ſubſtraction of fire made more or leſs violent, to drive the engine faſter or ſlower. To this piſton the end of the bob O, is faſtened by an iron chain, and as the piſton deſcends in the cylinder P, this end of the bob is drawn downwards, and *vice verſâ*; as the end O is drawn down, the other end of the bob I, aſcends, and by a chain, I K, draws up with it, from an iron or braſs cylindrical tube, called a pit-barrel*, through a tyre of wooden pumps, (O O, Plate XVIII. Fig. 1.) a column of water out of the mine equal in diameter to the bore of that tube, and in height to each ſtroke or motion of the piſton in the cylinder P, and the ſweep of the bob, I K. Many improvements have lately been added to this excellent piece of mechaniſm, among

[x] By act of parliament the duty of coals expended in the working fire-engines in Cornwall is remitted.

† Seventeen pounds eight ounces and 347 grains according to Helſham.

* Letter X, Plate XVIII. Fig. 1.

which

Fig.I.
South front of the Fire Engine.

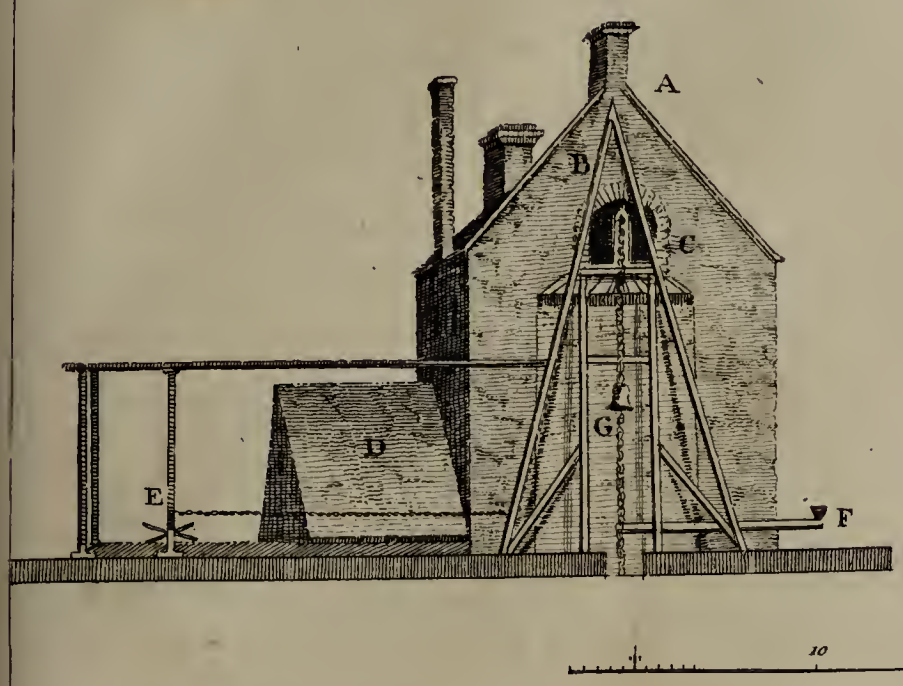


Fig.II.
Section from the West of the Fire Engine
Explaind p. 172

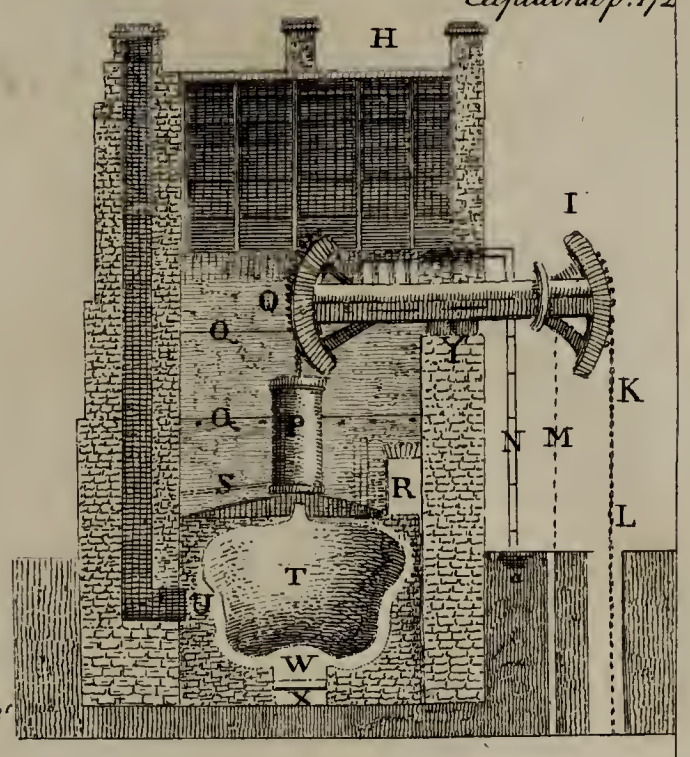
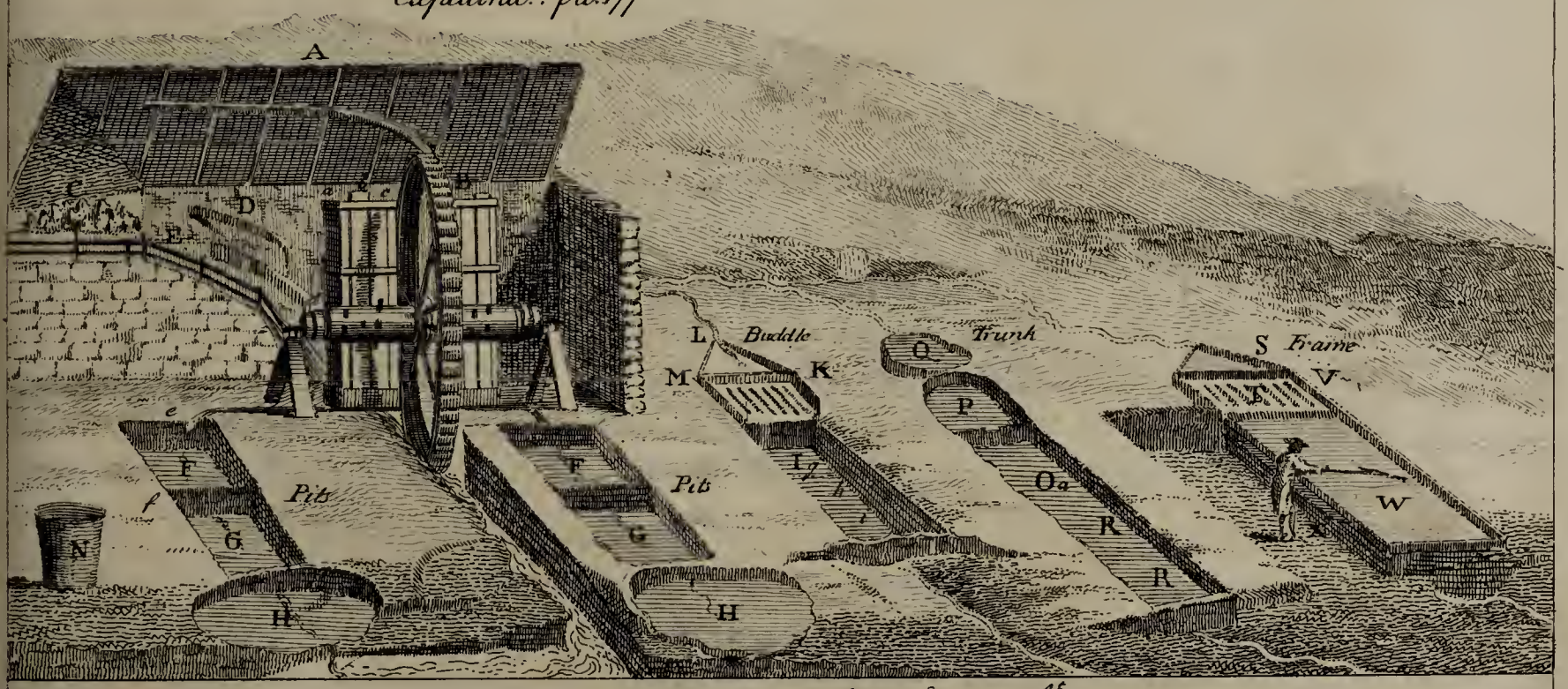


Fig.III. *Tin Stamping Mill & the works belonging to it*
Explaind . . pa. 177

4 8 16 24 fᵗ



10 20 30 40 50 60 70 80 90 100 fᵗ

Fig.IV.

Pornanvon Cove in the parish of S.ᵗ Just. Explaind pa. 76.

which I cannot but mention one in particular which is, that as this engine ſtood formerly, if the fire-men chanced to nod, the violence of the motion increaſing with the fire, the weighty bob, O I, beat, ſhocked, and endangered the whole machine, and the fabrick it is incloſed in; but now when the fire is at the extreme height, and the bob begins to beat and ſtrike the ſprings, it lets fall a trigger into a notch and ſtops the injection-cock, and the whole movement is ſtopped, till the injection of the cold water into the cylinder is reſtored; ſo that this engine is now brought to ſuch perfection, that in a great meaſure it tends, regulates, frees, and checks itſelf; ſeveral ſubordinate members, wires, clacks, and valves are all moved, opened, and ſhut by the force of the ſteam, and the motion of the piſton; inaſmuch as that by enlarging the cylinder, and other parts in proportion, few Corniſh mines are ſubject to more water than this engine will maſter: its power is in proportion to the diameter of the cylinder principally, the ſtrength of the ſteam, and the depth it draws. This, here exhibited Plate XIX. Fig. I. and II. is the fire-engine which, in the year 1746, belonged to the pool-mine, Plate XVIII. and the cylinder's diameter from the outer edge, was but three feet; but they make them much larger now; and it is imagined [y], that if they were ſtill to increaſe the diameter of the cylinder, and make it alſo ſhorter than they do now, the force would be augmented, and though the column of water exhauſted would be ſhorter, yet might this be well remedied by increaſing the number of tubes, which the greater preſſure on the piſton would eaſily manage. A cylinder of forty-ſeven inches bore at Ludgvan-lez work, in the pariſh of Ludgvan, making about fifteen ſtrokes in a minute, uſually drew through pit-barrels of fifteen inches diameter, from a pump thirty fathoms deep, about an hogſhead at each ſtroke, that is, fifteen hogſheads of water in each minute; ſo that the quantity of water raiſed in a given time, is as the ſquare of the diameter of the pit-barrels, O O X, Plate XVIII. Fig. I. and the height and number of the ſtrokes in that time. But the cylinders may be made much larger; that at Herland (or Drenack) mine, in the pariſh of Gwinear, is ſeventy inches in diameter, and will draw a greater ſtream of water at any equal depth, in proportion to the ſquare of its diameter. The only objections to this engine are the great expences in erecting, and vaſt conſumption of coals in working it. To obviate theſe expences ſeveral methods have been ſuggeſted of increaſing the elaſticity of the ſteam and reducing the ſize of the boiler [z], which can be decided only by experience, and to that we muſt refer them.

[y] See Philoſophical Tranſactions, vol. XLVII. page 197, for the years 1751 and 1752. [z] Ibid. vol. XLIX. part ii. page 539.

Its principal parts.

Explication of the principal members of the fire or ſteam-engine, Plate XIX. Fig. I. and II.

A, ſouth front of the fire-engine houſe; B, triangle for tending the engine pumps, &c. C, arch for the main bob to play in; D, coal-houſe and fire-place; E, capſtan, and cable for the triangle; F, Balance-bob to aſſiſt the draught; G, the bell.

Fig. II. H, ſection from the weſt; I, ſouth end of the main bob; K, main chain to draw up the water from the bottom; L, end of the balance-bob, marked F, in Fig. I; M, a ſmall chain drawing from the adit to a ciſtern, *a*; N, force-pump to ſupply the ciſtern, *b*, for the boiler T, &c.; O, north end of the main bob; P, the cylinder; Q, the planchings of the houſe; R, the eaſtern door; S, pipes to let out the air and ſteam from the cylinder; T, the boiler which ſupplies the ſteam; U, the damper, to moderate the fire; W, the fire-place; X, the aſhes pit; Y, the axis of the main bob.

Its profit to the publick.

Before we conclude this ſection, let it be obſerved, that the people of Cornwall are not the only gainers by the introduction of this uſeful engine; the government participates the profit, and indeed without hazard: it may not be amiſs therefore here to take a ſhort view of the advantage to the publick revenue ariſing from the neceſſary materials uſed in our Corniſh mines worked now by the fire-engines, ſuch as ropes, candles, timber, powder, iron, coal, &c. the duties of which, together with the profit of four ſhillings *per* hundred weight for all tin raiſed in the three following mines, ſtand as follows:

The neat gain to the government from the mine (moſtly of copper) called the North-Downs, in the pariſh of Reddruth, in one month, (the drawback of the duty on coals conſumed in the two fire-engines, amounting to forty-nine pounds fifteen ſhillings and ſix-pence, being firſt deducted) amounts to four hundred and ſeventy-nine pounds five ſhillings and ſix-pence.

In the mine called Pitt-louarn, Reſnorth, and metal-works, the neat gain to the government (the drawback on coals conſumed in two fire-engines, amounting to ſixty-two pounds four ſhillings and five-pence, being firſt deducted) is two hundred and eighteen pounds and four-pence *per* month.

In Polgooth mine, in the pariſh of St. Mewan, the neat gain to the government (the drawback on coals conſumed in one fire-engine, amounting to twenty-ſeven pounds eighteen ſhillings and four-pence, being firſt deducted) amounts, in one month, to two hundred and twenty-ſix pounds ſeven ſhillings and four-pence.

" Theſe

" Theſe calculations have been ſo faithfully extracted from the account-books belonging to theſe mines, that the whole may be atteſted by affidavits, if occaſion ſhould require [a]."

Hence it appears that the conſumption of coals in the fire-engine is very great, the duty of coals conſumed by theſe mines at five ſhillings *per* chaldron, amounting, in one month, to one hundred and thirty-nine pounds eighteen ſhillings and three-pence. The government prudently remits the duty on coals ſo expended, by which bounty, beſides repaying itſelf for the duties remitted, it gains clear by theſe works, when in full working, five hundred and twenty-three pounds thirteen ſhillings and two-pence in one month; whereas, without this bounty, fire-engines would not have been erected, nor could theſe mines, nor many others in the county, ever have been worked, and conſequently the loſs to the government would be as their preſent gain. There are ſeveral other very conſiderable mines now worked by the fire-engine in Cornwall [b], by all which the government gains in proportion to the materials uſed, and the metal raiſed.

SECT. XV. Dividing tin-ore.

The tin-ore being raiſed out of the mine, is then divided into as many ſhares, as there are Lords and adventurers. The Lord uſually hath a ſixth-part clear of coſt, but in conſideration of draining the mine, and otherwiſe encouraging the adventure, is oftentimes content with an eighth, and ſometimes a tenth. If the lands are bounded [c], then the bounder has the right of *ſetting*, or giving authority to ſearch and work, and has the ſixth clear, or as he agrees, and the Lord of the ſoil has only a fifteenth. The adventurers have in proportion to the part of the work which they carry on. Theſe ſhares (which they term *doles*) are parcelled out, being firſt meaſured by barrows, and then carried into ſo many different heaps; every mine having the privilege (to the great regret oftentimes of the huſbandman) of diſtributing and dividing the ore, on any the moſt adjacent parts of the field. As the barrows are carried off to their ſeveral diviſions, one perſon, who is the reckoner, keeps an account by notching a ſtick at every barrow: if there be any fractions in the numbers to be divided, they then divide the whole into five or ſix or more parcels, according to the proportion of the Lord's and bounder's ſhares, and leaving thoſe ſhares untouched, proceed to throw the remainder of the parcels all together into one heap, and then divide it eaſily among the adventurers; and it is ſurprizing

[a] Letter from William Lemon, Eſq; May 8, 1756, to whoſe accuracy and univerſal knowledge in the art of mining, I am indebted for theſe and other obſervations.

[b] Huel-rith in Godolphin-ball, Herland, Bullengarden, Dolcooth, the Pool, Boſproual, Huel-rôs, and ſome others.

[c] See before, page 167.

to

to ſee how ready and exact theſe reckoners are in dividing, though oftentimes they can neither write nor read. The parcels being laid forth, lots are caſt, and then every parcel has a diſtinct mark laid on it with one, two, or three ſtones, and ſometimes a bit of ſtick or turf ſtuck up in the middle or ſide of the pile; and when theſe marks are laid on, the parcels may continue there half a year or more unmoleſted; the property is fixed, and no one may add to, or diminiſh it.

SECT. XVI. Stamping and dreſſing tin.

What the ancient method was of preparing tin for the furnace, we cannot ſay; but Polybius the Hiſtorian is ſaid to have deſcribed it, and that work is commended by Strabo [d], but now loſt with other valuable compoſitions of that judicious author. The ſhort deſcription which we have of the tin-trade in Diodorus Siculus (lib. iv. page 301, edit. Hanov. 1664) muſt not be omitted, though it is too general for us to learn many particulars from it. "Theſe men (ſays he, meaning the tinners) manufacture their tin by working the grounds which produce it with great art. For though the land is rocky, it has ſoft veins of earth running through it in which the tinners find the treaſure, extract, melt, and purify it; then ſhaping it [by moulds] into a kind of cubical figure, they carry it off to a certain iſland lying near the Britiſh ſhore, which they call Ictis; for at the receſs of the tide, the ſpace betwixt the iſland and the main land being dry, the tinners embrace the opportunity, and carry their tin in carts, as faſt as may be, over to the Ictis (or port); for it muſt be obſerved, that the iſlands which lie betwixt the continent and Britain, have this ſingularity, that when the tide is full, they are real iſlands; but when the ſea retires, they are but ſo many *peninſulæ*. From this iſland the merchants buy the tin of the natives, and export it into Gaul; and, finally, through Gaul, by a journey of about thirty days, they bring it down on horſes to the mouth of the Erydanus, meaning the Rhone [e]." In this deſcription it will naturally occur to the inquiſitive reader to aſk, where this Ictis was to which the Corniſh carried their melted tin in carts, and there ſold it to the merchants. I really cannot inform him; but by the Ictis here, it is plain that the Hiſtorian could not mean the Ictis or Vectis of the ancients (at preſent called the Iſle of Wight), for he is ſpeaking of the Britans of Cornwall, and, by the words, it ſhould ſeem, thoſe of the moſt weſtern parts. Της γαρ Βρεταννικης κατα το ακρωτηριον το καλουμενον Βελεριον οι κατοικουντες, &c. Ουτοι τον κασσιτερον κατασκευαζουσι φιλοτεχνως, &c. that is, "thoſe who live at the

[d] Geogra. lib. ii.

[e] Rhodanus, ſays the Latin tranſlation; to Marſeilles, ſays Poſſidonius, in Strabo, lib. iii. page 147, edit. Par. 1620.

extreme

extreme end of Britain, called Belerium [f], find, dreſs, melt, carry and ſell their tin, &c. Now it would be abſurd to think that theſe inhabitants ſhould carry in carts their tin near two hundred miles, (for ſo far diſtant is the Iſle of Wight from them) when they had at leaſt as good ports and harbours on their own ſhores as they could meet with there; beſides, theſe inhabitants are ſaid, in the ſame paragraph, to have been more than ordinarily civilized by converſing with ſtrangers and merchants. Thoſe merchants then muſt have been very converſant in Cornwall, there trafficked for tin, that is, there bought, and thence exported the tin, or they could have no buſineſs there, their reſidence would have been in ſome of the ports of Hampſhire, and Cornwall could ſcarce have felt the influence of their manners, much leſs have been improved and civilized by them at that diſtance. Again: The Corniſh, after the tin was melted, carried it at low-water over to the Ictis in carts; this will by no means ſuit the ſituation of the Iſle of Wight, which is at leaſt two miles diſtant from the main land, and never (as far as we can learn) has been alternately an iſland and a *peninſula*, as the tide is in and out. The Ictis therefore here mentioned muſt lye ſomewhere near the coaſt of Cornwall, and muſt either have been a general name for any *peninſula* on a creek, (Ik being a common Corniſh word, denoting a Cove, Creek, or Port of traffick,) or the name of ſome particular *peninſula* and common *emporium* on the ſame coaſt, which has now loſt its iſtmus, name, and perhaps wholly diſappeared, by means of ſome great alterations on the ſea-ſhore of this county. But to return: If this art of manufacturing the tin was ever at any great height among the ancients (as this author ſeems to intimate), it has had its riſes and falls like all other arts, for ſo late as the reign of Elizabeth, the proceſs ſeems to have been in a ſtate of imperfection, and to have been greatly altered for the better, by the then Sir Francis Godolphin of Godolphin, Knight, as Mr. Carew informs us (page 13 and 153); it has been improved ſince that time, and is ſtill capable, I believe, of farther improvements. It will therefore be the more excuſable to give a detail of this proceſs, and ſet forth the whole method of ordering the tin-ore, as it is practiſed by the moſt ſkilful artiſts of the preſent time, illuſtrating the ſame with the mill, and the ſeveral works ſubſervient thereto.

SECT. XVII. The preſent method of dreſſing or preparing tin-ore for the furnace. Of ſtamping.

The tin-ore being divided, is then (as every owner's opportunity ſerves) carried to the ſtamping-mill, and depoſited on the area or floor at C, Plate XIX. Fig. III *. If the ore be very full of clammy ſlime, it is turned from the area, C, into a pit near by, called a Buddle, L I, to make it ſtamp the freer without choaking the

[f] Now called the Land's End.

* Page 172.

grates, and brought back to C. If the ore is not ſlimy, it is ſhovelled forward from C into a ſloping chanel of timber, E, called the *Paſs*, from whence it ſlides by its own weight, and the aſſiſtance of a ſmall rill of water, D, into the box at Y; there by the lifters, *a*, *b*, *c*, falling on it after being raiſed by the axel-tree, *d*, which is turned round by the water-wheel, B, it is pounded, or ſtamped ſmall: to make the lifters more laſting, and fall upon the ore with the greater force, they are armed at the bottom with large maſſes of iron of one hundred and forty pounds weight each, called Stamp-heads; and to aſſiſt the attrition, the rill of water, D, keeps the ore perpetually wet, and the ſtamp-heads cool, till the ore in the box, Y, is pulverized, and ſmall enough to paſs through the holes of an iron grate at Y. The grate is a thin plate of iron, no more than the tenth of an inch thick, one foot ſquare, full of ſmall holes punched in it about the bigneſs of a moderate pin, not always of the ſame diameter, but as the different ſize of the tin granules requires; for the larger the cryſtals incloſing the metals are, the larger muſt be the holes, and *vice verſâ*; ſo that in ſuiting the grate to the nature of the tin, the ſkill of the dreſſer appears. From this grate the tin is carried by a ſmall gutter, *e*, into the forepit, F, where it makes its firſt and pureſt ſettlement, the lighter parts running forwards with the water through holes made in the partition, *f*, into the middle pit, G, (much of the ſame ſhape and ſize as the forepit) and thence into the third pit, H; what ſettles in G and H is called the *ſlimes*, and what runs off from them is good for nothing. The forepit, F, as ſoon as full is emptied, and the contents carried to the buddle, I, a pit ſeven feet long, three wide, and two deep: the dreſſer, ſtanding in the buddle at I, ſpreads the pulverized ore at K, called the head of the buddle, in ſmall ridges parallel to the run of the water which enters the buddle at L, aud falling equably over the croſs-bar, M, waſhes the ſlime from the ridges (which are moved to and fro with a ſhovel) till the water permeating every part, waſhes down the whole into the buddle, I: whilſt the dreſſer's hands are employed in ſtirring the ridges at K, he keeps his foot going always, and moves the ore to and fro, ſo as the water may have full power to waſh and cleanſe it from its impurities; the buddle fills, and the tin is ſorted into three diviſions; that next the head, at *g*, is the pureſt; the middle, at *h*, is next in degree; that at *i* moſt impure of the three; and each of theſe diviſions goes through a different proceſs: the forepart, at G, is taken out firſt, and carried to a large tub, N, called the *Keeve*; there immerſed in water, it is moved round with a ſhovel for a quarter of an hour, by which means the impurities riſe from the ore, and become ſuſpended in the water; the tin-ore is then

Buddling.

then ſifted in a ſieve purpoſely conſtructed, and if it needs, muſt be ſent to be buddled again, then returned to the keeve and worked as before with a ſhovel, which they call *tozing* the tin: the keeve is then *packed*, that is, beat with a hammer or mallet on the ſides, that the ore within may ſhift and ſhake off the waſt, and ſettle the purer to the bottom. The foul water then on the top of the keeve is poured off, and the *ſordes* which ſettles above the tin, is ſkimmed off, and what remains is pure enough to be ſent to the melting-houſe, and is then called Black-tin. The waſt ſkimmed off, is carefully laid by to undergo another waſhing. Whilſt the forepart of the buddle, I, is thus manufacturing at the keeve, another hand is moving forth that part of the buddle, *h*, in the ſame manner as *g* was before; and in its turn that, and the ſettlement at *i*, is promoted to the keeve, and thus what is depoſited in the forepit, F, is *brought about*, as the tinners term it, that is, undergoes all the neceſſary lotions.

What runs off from F, into G, and H, muſt be dealt with in another manner. The contents of theſe pits conſiſt of the ſmall and lighter parts of the ore, and are intimately mixed with a greater quantity of earth and ſtone bruiſed to duſt by the mill. Theſe are called the *ſlimes*, and are carried by ſome boys (moſtly under fourteen years of age) by direction of the chief workman, to the trunk O, whoſe head (called the Pednan) is a ſemicircular pit, wherein a boy moves the ſlimy tin round with a little ſhovel that the water (which runs into P from Q, called the Strakes) may waſh away both the filth and tin over a croſs ſtick or board about ten inches deep: the board is ſomewhat lower in the middle than at each end, for admitting the watry mixture with more eaſe into the body of the trunk, O, R, R, which is a pit lined with boards ten feet long, three wide, and eight inches deep; that which reſts in the forepart of the trunk at O *a*, is carried off to be *framed*, and the ſettlement at R R, is moved forward to P to be trunked over again before it is fit for the *frame*. The frame, T W, conſiſts of two planes of timber; the body W, the head T. The water falling in a gentle manner from S upon the head T, waſhes the ore, which there offers itſelf (as at the buddle) in little ridges, downwards over a ſlope piece of timber, U, called the *Lippet*, into the body of the frame W. Upon this frame the water is ſpread ſo thin, and runs ſo ſlowly, (the plane being nearly horizontal) that by moving the ſlimy tin to and fro with a light hand, and expoſing it cautiouſly to the water with a ſemicircular rake, all the *ſordes* is waſhed away, and the tin, though ever ſo ſmall, remains on the frame near the head; when the tin is found ſufficiently clean, the body of the frame, which is fixed on two iron axes, called Melliers, one at the head, the

Trunking the *ſlimes*.

Framing.

the other at the foot, (by ſlipping the ſtake which ſupported it) is turned eaſily from horizontal to perpendicular, and the tin, which remained on the frame, runs off, by the aſſiſtance of a little ſprinkling, into a wooden cheſt, X, called the coffer, which lies below ready to receive it; the frame is then righted into its horizontal poſition, and the ſame proceſs repeated, till the coffer is full; the contents are then carried to the keeve N, where they are tozed, ſifted, and packed; the ore is then carried back again to the frame, W, and *cazed*, which is performed by ſtopping the lower end of the frame with ſlime and turf that the water may be quite ſtill, and the tin more eaſily ſettle upon the frame, and deſcend the more ſurely into the *coffer*; the coffer is then emptied the ſecond time, the tin carried again to the keeve, there tozed, ſkimmed, and packed; and thus the ſlimes are finiſhed, and brought to as great a degree of purity as the ſize of the tin (which, being exceedingly ſmall, will neceſſarily have ſomewhat more of waſt than what is larger and heavier) will permit.

Thus proceeding only upon this ſingle principle, that the force of water, properly applied and introduced among the particles of ore, and the ſordes mixed with it, will diſperſe the latter, and leave the former at reſt for them to collect and treaſure up, they vary their operations inconceivably, conducting with great ingenuity, leſſening, increaſing, diffuſing, or contracting their water (the great inſtrument of purity), as the ſize, weight, and combinations of the metal and its feeders do require; indeed, it is ſurprizing to ſee with what eaſe, cheapneſs, and regularity all theſe ſeveral proceſſes are performed.

It muſt here be remembered, that mundic, and ſome other ſemimetals, being ſpecifically heavier than the tin, whatever tin-ore is incorporated with theſe muſt firſt be burnt, and the ſulphur, *&c.* evaporated, and then, and not otherwiſe, will the water waſh away the remains of the ſemimetal, and leave the tin behind. This buſineſs of *dreſſing* is a particular trade, entirely different from that of the labouring miner, and is beſt learned under a maſter-workman, who makes it his ſole occupation to follow the ſtamping-mill, and the works belonging thereto. This maſter-workman hires boys from ſeven or eight years old to eighteen, gives the former about three ſhillings a month, and raiſes their wages as they advance in age and workmanſhip, till they have man's wages, *viz.* at the leaſt twenty-four ſhillings, at the higheſt thirty ſhillings *per* month. This is of double benefit to the poor parents; the boys being taken in ſo young become healthy and hardy by uſing themſelves to cold, and to work with wet feet all day; and, 2dly, they learn early to contribute to their own maintenance. Each ſtamping-mill, which has

conſtant

conſtant work and water, will employ one man and five boys; and one hundred ſacks (each ſack containing twelve gallons) are ſtamped, waſhed, and fitted for melting at the rate of ſix-pence *per* ſack (or fifty ſhillings *per* hundred) more or leſs ſomewhat, according to the quality of the ore, in the ſpace of a few days. For bruiſing the tin-ore into a finer powder, formerly they uſed the crazing-mill (Carew, page 12) after the ore was ſtamped, an engine not much unlike the preſent griſt-mill; but Sir Francis Godolphin beforementioned (as it is ſuppoſed) either invented or improved this much more effectual engine the water ſtamping-mill here exhibited, ſo as it might ſerve all purpoſes, and the other has been ever ſince diſuſed.

SECT. XVIII. Of melting tin.

Tin, being *dreſſed*, is carried in ſacks under the general name of Black-tin (though what is called Frame-tin is uſually of a yellowiſh earthy colour, and ſome other ruddy brown, and ſome cinereous and whitiſh) to the melting-houſe upon horſes, each horſe carrying about three hundred pounds weight. Here, the parcel brought is firſt aſſayed; in order to which, either the whole parcel is emptied into clean timber hutches, and there well mixed, or a little out of every ſack is taken by the aſſayer, and well mixed together, that the aſſay of that little parcel may aſcertain the real quality of the whole: for it muſt be obſerved, that although the proceſs of cleanſing all ſorts of tin is nearly the ſame, and after this cleanſing all goes by the name of Black-tin, yet each parcel of every work may be of different value, according as it is more or leſs ſkilfully dreſſed, and according as the different *pabula* with which it is incorporated do either promote or obviate the fuſion of the metal. That this "black-tin therefore is ever all of the ſame richneſs and yields alike," as Dr. Woodward [g] was informed, is a great miſtake. Kal, for inſtance, *viz.* wild-iron, is reckoned to mix well, and melt kindly with tin-ore, and increaſes the quantity of melted tin in a greater proportion than the quality is thereby debaſed, as we find by that of Huel-boys mine in St. Juſt, and that of other places; ſuch ore will therefore yield one quarter of a twentieth part more than ore of a much finer appearance to the eye. The melter is not paid in money for melting the tin brought, but by allotment of ſuch a ſhare in twenty: for the charges of coals, labour, and utenſils, expended in the fuſion, the melter has uſually $\frac{8}{20}$, the other twelve in twenty parts remaining to the owner: ſome tin however will bring the owner twelve and a half and thirteen out of twenty, which is the moſt that is given: on the other hand, ſome black tin has ſuch a quantity of other metal, or of its own ſtubborn feeder adhering to it, that it will not bring more than

[g] Catalogue, vol. II. page 31, m. 26.

eight for twenty to its owners. The melter having bargained for the parcel brought, gives his note to deliver the quantity of white tin agreed upon at the enſuing coinage, and at his own conveniency (taking care judiciouſly to mix, correct, and qualify the different ſorts of tin which he takes in) melts the tin in a reverberatory furnace, with a fire of pit-coal, all which comes from Wales. The great conſumption of wood uſed in charcoal by the former and more ancient method [h] of melting tin by a *blowing-houſe* [i], ſuggeſted at laſt the neceſſity of introducing the pit-coal for this purpoſe, and among the reſt to the noble Sir Bevil Granville of Stow in this County [k], who (as I have been informed) made ſeveral experiments for melting of tin therewith (though without ſucceſs) in order to ſave wood, and keep the tin from waſting in the blaſt. The invention of the reverberatory furnace, about fifty years ſince, has rendered this fire effectual, but the pit-coal leaves a ſulphureous brittleneſs in the metal which the wood-fire does not, the former aſſimilating in ſome meaſure the metal to the harſhneſs of ſtone, and the latter infuſing the toughneſs of wood; and this is the reaſon that tin melted in the blowing-houſe by charcoal ſells for more at the market (uſually a twelfth part more) than that of the furnace, as being the purer metal. When the ore is ſufficiently melted, it is poured into quadrangular troughs or moulds of ſtone, containing about three hundred and twenty pounds weight of metal [l], which, when hardened, is called a block of tin, and carried to the coinage town.

Of coining tin.

Five towns [m] are appointed in the moſt convenient parts of the county for the tinners to bring their tin to every quarter of a year. In the time of Henry VIII. there were but two coinages in a year, *viz.* at Midſummer and Michaelmas [n], but two more were added at Chriſtmas and Lady-day, for the conveniency of the tinners, for which they pay an acknowledgement (called Poſt-groats) of four-pence for every hundred of white tin then coined. When the tin is brought to the coinage-town, the officers appointed by the Duke of Cornwall aſſay it, by taking off a piece of one of the under corners of the block of about a pound weight, partly by cutting and partly by breaking; and, if well purified, ſtamp the face of the block with the impreſſion of the ſeal of the Dutchy [o], which ſtamp

[h] At preſent practiſed in ſome parts of Cornwall but only for ſmall parcels.

[i] Called ſo from a fire or blaſt perpetually kept in vigour by the blowing of a large bellows turned by a water wheel.

[k] Temp. Car. 1.

[l] Formerly they made not theſe blocks ſo large, as appears by the blocks lately found in St. Auſtel-Moor mentioned pa. 163, which do not weigh full 30lb.

[m] Liſkerd, Loſtwythyel, Truro, Helſton, and Penzance, which laſt was added to the four ancient Towns, in the time of Charles II. for the conveniency of the Weſtern tinners.

[n] Leland, Vol. iii. Itin. page 12.

[o] The arms of Condorus laſt Earl of Cornwall of Britiſh blood (temp. W. 1.) were Sab. 15 bezants (5, 4, 3, 2, 1) in pale, Or. See Camden, page 26. Richard King of the Romans, Earl of Cornwall, ſon to King John, threw theſe bezants into a bordure round the bearing of the Earls of Poictou: He bore therefore Argent a Lyon Rampant Gul. crowned Or within a bordure ſable garniſhed by Bezants, (ſee Camden, page 27) and this ſtill continues the Dutchy Seal.

is

is a permiſſion for the owner to ſell, and at the ſame time an aſſurance that the tin ſo marked has been purpoſely examined and found merchandable. The ſtamping of this impreſſion by a hammer (in like manner as was anciently [p] done to money to make it current) is called coining the tin. Every hundred of white tin ſo coined, pays to the Duke of Cornwall the ſum of four ſhillings before the property can be diſpoſed of, and this makes up a conſiderable annual revenue, much ſuperior at preſent to what it was formerly. "The tin ſo ſold (ſays Mr. Carew, p. 15) uſually amounted heretofore to thirty or forty thouſand pounds [q] at twenty and thirty pounds a thouſand, ſometimes higher and ſometimes lower;" but for ſome years laſt paſt, the price of each hundred weight of white tin has conſiderably advanced, and been from three pounds three ſhillings to three pounds eight ſhillings and ſix-pence, and the quantity ſold has been much greater; ſo that the tin of the whole county, for fourteen years laſt paſt, has amounted, one year with another, nearly to the ſum of 180000 pounds ſterling; and for ten years laſt paſt by a particular account of the number of blocks coined in that time, and the price they ſold at (though ſomewhat low for four years laſt paſt) I find that the whole tin of this county has, at a moderate computation, brought in caſh, one year with the other, at leaſt to the amount of one hundred and ninety thouſand nine hundred and fifty-three pounds nineteen ſhillings and three-pence halfpenny. Of this the Duke of Cornwall receives (for his four ſhillings duty upon every hundred weight of white tin) above ten thouſand pounds yearly; the bounders and proprietors of the ſoil may receive about one ſixth at a medium clear, which we may reckon about thirty thouſand pounds yearly; the remainder goes to the adventurers in the mine, who pay for all labour and materials, and may ſometimes chance to be loſers (as in every kind of merchandize is ſometimes the caſe) but muſt always have the commendation and inward comfort of contributing in a great degree to the employment of the poor, to the enriching of their county, and to the increaſe of the public revenue.

Its annual profit.

If, together with the Caſh which tin brings in clearly to the Lord of the Soil, procures as duties to the King by its mines, and to the Duke of Cornwall as tax upon every hundred weight of tin, we conſider the ſeveral branches of employ which it creates for boys as well as men, carriage by cattle and ſhipping, the many handicrafts it promotes, and the trade for neceſſaries, which belong to mining, dreſſing, and melting, and all this out of a narrow ſlip of land uſually of the moſt barren and hilly kind, without diſtreſſing the tillage,

[p] Till the year 1553 when the coining mill was invented.

[q] Yearly, as Mr. Norden, page 14, explains Mr. Carew's meaning.

paſture,

paſture, or fiſhery, tin muſt needs appear to be a great bleſſing to this county; but indeed that part of it where the mines chance to be at preſent, *viz.* from St. Auſtel weſtwards, feels this advantage moſt ſenſibly, lands bringing a higher rent, the number of people being greater, and the markets much better ſtocked with buyers, than the eaſtern parts of the county where there are no mines.

SECT. XIX.

Uſes of tin.

The uſes of tin are many: the ancients uſed it to make their mirrours, which ſerved all the purpoſes of looking-glaſſes; but to this conſumption luxury put a ſtop (ſays Pliny) by introducing of ſilver: in other particulars their uſes of this metal were much the ſame as thoſe of the preſent age, though not ſo many. Tin is uſed in tinning braſs and copper furniture of the kitchen, in ſodering pipe and ſheet-lead, in making of lattin, bell-metal, hard-wares, in lining of looking-glaſſes, in ſurgery, medicine, and painting, but above all in making pewter, which in ſome meaſure is uſed in all civilized nations, by every degree, from the pooreſt day-labourers to the prince upon the throne, there being hardly a houſe in Europe, or any part of the world where commerce reaches, but has ſome pewter: in all theſe particulars the conſumption is as general as the uſe, and freſh demands and freſh ſupplies are perpetually quickening and urging on one another.

SECT. XX.

Tin in general, its origine, connexions, ſhape, and richneſs.

Tin is the lighteſt of all metals, being reckoned nearly to water as 7321 to 1000 [r]; the ſofteſt of all metals, (lead only excepted) and the leaſt fixed in fire; it eaſily mixes with other metals, but imparts a brittleneſs to all; *aqua regia* is its proper natural *menſtruum*.

Coæval to the creation.

Tin in its natural ſtate and hardeſt bed muſt, I ſhould think, be reckoned coeval with the creation; for it is found in bunches and ſpots in the granite, and the much harder ſtone of the Elvan kind, ſtones which can give no ſuſpicion of their having ever been diſſolved and *reformed* ſince the firſt induration of ſolids; in laxer nidus's the particles of tin may have fluctuated and changed ſituations. It has been imagined that tin ſettled in ſuch bunches by the percolation of waters charged with tin, but theſe bunches are frequently found in ſeparate blocks of ſtone, open to day, and ſubject to no moiſture but that of the heavens, and conſequently to no percolation. Again: In percolation, either the texture of theſe ſtones would in a great meaſure reſiſt the paſſage of the tin, or would freely permit it; in the firſt caſe, we ſhould find the tin condenſed near the ſurface; in the latter, find it ſunk and collected near the bottom; but it is diſperſed without any regard to either.

[r] But in the computation allowance ſhould be made for the different purity of the weighed ſpecimen.

Tin

Tin nearly approaches to ſilver in colour, but has ſo much more ſulphur in it, that it quickly tarniſhes in the air or moiſture, and is really not ſo ſubject to hold ſilver as its ſiſter lead, which is reckoned an inferior metal; but, beſides the colour, it has ſeveral properties in common with ſilver, and frequent connexions with it; diſſolved in ſtrong acids it grows bitter as well as ſilver; fuſed with ſilver obſtinately adheres to it, and reſiſts lead almoſt as much as ſilver. Silver, though not of the pureſt kind, may be extracted from tin [s]. In the neighbourhood of Oruro (a town in Peru famous for the mines near it) is the Colloquiri, which although a mine of tin, yet now and then in following the veins thereof, they meet with rich ores of ſilver, which they call Lipta [t]. Its connexion with ſilver.

Native tin, or tin found in the Corniſh mines in a metallic ſtate, I am not certain that I ever ſaw; but March 21, 1747, viewing a rich piece of tin-ore from Boſſehan in the pariſh of St. Juſt in a microſcope, I thought I ſaw a ſmall liſt of maturated tin, white, ſhining like a thread of melted pewter; I then took a greater magnifier, and plainly perceived the ſame liſt; but intending to try further experiments to aſcertain the truth, I could not afterwards find the ſpecimen, and therefore do not aſſert the matter of fact. Agricola [u] aſſerts, that this metal is no where found ſo pure as to be malleable; but the learned Dr. Grew (Muſæum R. S. page 328) deſcribes one ſpecimen of "native tin lying as it were in bright drops in a brown ſtone," and I ſee no reaſon why tin may not poſſibly be refined, and the impurities of its *pabulum* ſeparated by diſſolvent juices in the bowels of the earth, in like manner as copper is. Metals (as it ſeems to me) are only enſhrined, more or leſs concealed, and wrapt up into ores by ſalts, ſulphur, and ſtone, which are ſometimes removed by a ſubtil *menſtruum* in the earth. This is frequently the caſe of copper, ſometimes of ſilver; and gold, the moſt perfect of metals, is ſtill more frequently found in a metallic than any other ſtate; but with tin this very rarely happens, by reaſon of the ſcarcity of its proper *menſtruum*. Sea-ſalt (the baſis of *aqua regia*) being the only ſalt we know which will operate on tin, diſperſe the impurities, and releaſe the metal. Native tin.

As white as tin is when melted, yet in the ore it is generally black, and the cryſtals, which incloſe the metal, are like black glaſs. We have however ſome white, ſome cinereous, and ſome red tin grains, and ſome of a reſinous colour, but they are rare, and I fear often thrown away by the heedleſs, although curious as well as profitable. *Stamping* and *dreſſing* do but pulverize and reduce the ore to ſmaller cryſtals, and the ſordes which intervene Tin cryſtals.

[s] See Boerh. Chem. by Shaw, page 97.
[t] Alonſo Barba, page 92.
[u] Page 421, ſee alſo Woodward's Cat. vol. I. claſs ii. part ſecond.

being waſhed away, the cryſtalline parts, mixed with a flux proper to evaporate them, do not prevent the fuſion of the metal incloſed. As to the ſhape of theſe cryſtals, tin is ſaid to diſpoſe them to the quadrilateral pyramid figure[w]; but this is not all, Nature has given us a greater variety of figures, but moſtly geometrical, ſtraight-lined, and angular, ſo that indeed it is difficult to ſay which figure this metal covets moſt; this we may be ſure of, that all metals vary the ſize as well as figure of their mineral granules in proportion to their own, and the power and quantity of the ingredients connected; thus, for inſtance, in the caſe before us, tin-ore ſhall be compoſed of cryſtal, ſalt, ſpar, ſulphur, and metals and ſemi-metals more than one, of all which the figure ſhall partake, and be regulated, mixed, and qualified, according as the tin, which is the principal, is determined by the ſeveral ſubordinate concretions intermixed; nor let it be thought by the reader fanciful and unprecedented to take notice and exhibit here the ſeveral ſhapes of tin and other metallic ſhoots. The greateſt Naturaliſts have not thought them unworthy their notice. Dr. Tancred Robinſon obſerves in his MS. Itinerary of Italy (ſays Mr. Ray of the creation, page 94) the wonderful diverſity of ſhapes and colours that oars and other foſſils ſhoot into, reſembling almoſt every thing in nature, for which it ſeems very difficult to him to aſſign any cauſe or principle; in the pyrites alone, he believes he himſelf may have ſeen, at home and abroad, above a hundred varieties." I ſhall therefore proceed in the ſame manner with all our foſſils, as I have done with the mundic or pyrites before, (page 137, *&c.*), and ſet forth, in their natural ſize, the ſeveral ſhapes of tin-grains, or cryſtals incloſing tin, found in our Corniſh mines.

The following figured tin-grains have occurred to me, and are exhibited in the annexed Plate.

Fig. I. Is a compreſſed oblate pyramidal tin-grain of a reſinous colour and texture.

II. Side-view of a black tin-grain indented in the centre.

III. Front of the ſame, the apex towards the eye, with a perfect rhombus in the middle indented, regularly liſted round the edges; from two angles of the rhombus, the liſt is only continued along two of the four ridges which diverge from the central point.

IV. Ten inclined planes, quadrangular, triangular, and hexagonal; black; compoſing all together one complete figured tin-grain.

V. Irregularly quadrangular planes, the ſurfaces larger in the mid-

[w] Woodward's Cat. vol. I. page 220.

dle

PLXX. *FIGURD TINS,* *pa.186.*

I II III IV V VI *f*

VII VIII IX X XI XII XIII

XIV XV XVI XVII XVIII XIX A B

3 6 9 12 Inches

Scale to N° XIX.

XX XXI XXII XXIII

XXIV XXV XXVI XXVII XXVIII

XXIX XXXI XXXII

Button Iron ore.

XXXIII XXXIV

Tessellated Lead.

XXXV XXXVI

Tipperary Lead.

XXXVII

one grain of Lead.

XXX

XXXIX

XL

a *b* *c* *d*

one branch in flower by a larger Scale.

f *f* *f*

C *c* *c*

XLI

d *d* *a* *b*

C

The Nat: Corolla Size.

C

XXXVIII

A 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Scale of feet for the Aloe.

Great American Aloe in flower described pa.226. by Scale AA.

Great American Aloe shooting in order to flower by Scale AA.

To the Rev.d Charles Lyttelton L.L.D: Dean of Exeter and F.R.S. this Variety of Tins and the American Aloe in blossom are inscribd with great respect by Wm: Borlase.

dle, and contracting gradually at each end; black, ſmooth, ſhining as glaſs.

Fig. VI. A very large grain of tin; the priſmatic ridges in which this metal delights, are here placed nearly at right angles. It has a ſmall rhomboid plane at the point of inſertion where the ridges meet at *e*; but where the ſides of the two ridges ſhould meet, as at *f f*, they are there planed off. The largeſt tin-grain I have yet ſeen.

VII. The ſurface of this grain is divided into eight triangular planes, ſo applied to one another as to conſtitute four ridges meeting in a ſmall central *ſulcus*. This figure is very rare, and the planes of a high poliſh.

VIII. A columnar grain on a rhomboidal baſe.

IX. D°. more diſtinct, the apex a quadrilateral pyramid.

X. A bunch of tin-grains, connected as if one large grain with its ſurface differently ſhot. The figures are pyramidal and cuneoid, three of the latter ſpread like the toes of a bird from the point of contact.

XI. An equilateral triangular plane projecting from a parallel ground, edged on one ſide with a quarter-round bead parallel to the adjoining ſide of the triangle.

XII. A pyramidal pentahedral grain perfectly ſmooth and black; its front conſiſts of two unequal equilateral triangles, divided by a *ſulcus*; of the other faces of the pyramid, two are cuneoid, the other circular.

XIII. Plan of the foregoing pyramid, N°. XII.

XIV. A quadrilateral, irregularly-pyramidal grain. The two ends are cuneoid, the two ſides deſcend from the apex in a ſlope, ſtriated to the bottom, where the *ſtriæ* ſpread off in an obtuſe angle, as if deſigned to form another pyramidal proceſs of like ſtructure on each ſide.

XV. Another of like form, but more finiſhed in figure, and of higher poliſh.

XVI. A plan of a quadrangular pyramid on a column of a nearly ſquare baſe; one face of the pyramid is divided into two nearly equal triangles by a ſubſidence in the middle, approaching ſomewhat to N°. VII.

XVII. The elevation of N°. XVI.

XVIII. Grain-tin melted, firſt in the common way, then farther purified, as far as the preſent method will permit.

XIX. A, the front, and B (by ſcale annexed) the back-view of an ancient block of tin, explained before, page 163.

XX. A curious grain of tin, black and ſhining, with *flammulæ* of a golden colour; the faces pentahedral; but the greateſt rarity of this

ſpecimen

ſpecimen is, that it is fixed on a baſe of a metallic hue at *a a*, *b b*, whoſe compoſition is micaceous, ſcaly, and ſoft, like burnt tin; it reſiſts *aqua fortis*, and as it has the exterior of native tin, might poſſibly be miſtaken for ſuch, though meer talc.

Fig. XXI. A pentahedral pyramid of cryſtalline tin, the ridges and ſides concave, with a ſlender rhomboidal, well-finiſhed plane on the apex; it has many ſhining yellow *flammulæ* in it, and not improbably holds gold.

XXII. A quadrilateral pyramid of tin, with a ſlender rhomboidal plane on one of the angles, with ſome ſparks of yellow as before; but more reſinous.

XXIII. A tin-grain extended like a book unfolding. Theſe four laſt curious ſpecimens came from Huel-fortune in Breag.

XXIV. On a rhomboidal baſe two quatrilateral pyramids applied baſe to baſe.

XXV. Two pentahedral pyramids joined baſe to baſe, each having a pentagonal cellule in the center of its apex. Both from St. Mewan Glebe.

XXVI. The ſide-view of two hexagonal pyramids of tin joined baſe to baſe.

XXVII. One of the pyramids with the apex in front.

XXVIII. Section at the fracture of a piece of tin in undulated ingrailed ſheaths, nearly of an equal thickneſs throughout, incloſing one another; the central nucleus is baſe cryſtal.

XXIX. A white pyramidal grain of tin with tranſverſe belts of black.

XXX. A red, tetrahedral pyramid of tin found in a ſtream-work in St. Auſtel, 1757.

Let it be obſerved, in the laſt place, that whatever the figure of theſe cryſtals is, this is the pureſt ſtate of tin-ore, that ore producing moſt metal which has moſt of theſe grains and largeſt under any equal ſurface; and black-tin is no more than theſe cryſtals cleared of their impurities.

Rich tin-mines.

The richeſt tin-mine I have ever heard of, as to the quality of the ore, is one in the pariſh of St. Agnes, near the beacon, called Polberou. Several parallel and contiguous veins, moſtly of large-grain cryſtals, make the treaſure of tin in ſuch quantity, that, in the year 1750, they could not get horſes enough in the neighbourhood to carry the tin from the mine to the melting-houſe, but carried it in ploughs, a very unuſual ſight (though doubtleſs a more effectual and eaſy draught where the ways will admit of wheels.) Great part of the ore was ſo rich and pure that it needed not to be ſtamped, and the lode is ſo large that it affords vaſt rocks of tin: one rock, in March 1750, was brought to Killinick melting-houſe near

near Truro, which, as a clergyman preſent at the weighing informed me, weighed ſix hundred and ſixty-four pounds, and it brought eleven and half for twenty, in the ſtone without ſtamping and dreſſing. I have ſince been informed, that one ſtone, brought to the melting-houſe from the ſame work, weighed 1200 pounds. It is judged that the late Mr. Donithorn, who had the whole adventure, and worked it at his ſole expence, in a few years laſt paſt got at leaſt forty thouſand pounds clear by this mine, and much more tin he might have raiſed yearly if he pleaſed. It is a mine at preſent deep and wrought at a great expence by a water-wheel, bobs, and whims; but the lode is wide, rich in quality, and turns out great profit.

The mine which has turned out the moſt gain, and the greateſt quantity of tin as yet known, is "Polgooth, in the pariſh of St. Mewan, where it appears by the old books, that the adventurers have got twenty thouſand pounds annually for a great number of years following [x]."

SECT. XXI. Summary of the ancient and preſent conſtitution of the ſtannaries.

How far the Phenicians and Grecians intereſted themſelves in the management of our mines, and whether, as is more probable, they were any other than the merchants to purchaſe and export our tin when raiſed, cannot be decided; but as it appears at preſent, from the teſtimony of Polybius, Strabo, Diod. Siculus, and Pliny, and others, that the Romans traded hither for tin, and improved the inhabitants in mining; ſo by their coins, ſepulchres, and ſacrifical inſtruments found in and near the ancient tin-works, (whither nothing perceivable could tempt them, but the riches of thoſe mines [y]) it is as apparent that the Romans worked thoſe mines, or at leaſt with their ſoldiers ſuperintended the workmen. At this time the Britans had likely little or no property; they were the working miners under their conquerors, but what regulations they were ſubject to is uncertain.

The Saxons are ſaid to have neglected the Corniſh tin-mines; but indeed they had no authority in Cornwall till it was entirely conquered by Athelſtan, after which they had no leiſure, their attention was wholly taken up by the Daniſh wars; theſe wars at laſt prevailed, and the Danes ſoon after gave way to the Normans, and theſe laſt promoted the working of our mines to their great emolument. However, in the time of King John, I find the product of tin in this county very inconſiderable, the right of working for tin being as yet wholly in the King, (King John being at this time alſo Earl of Cornwall) the property of the tinners precarious and

[x] Letter from Mr. W. Roſwarn of Truro, Feb. 11, 1756.

[y] See Antiq. of Cornwall, page 279.

unſettled, and what tin was raiſed, was engroſſed and managed by the Jews to the great regret of the barons and their vaſſals. The tin-farm of Cornwall at this time amounted to no more than one hundred marks, according to which valuation the Biſhop of Exeter received then in lieu of his tenth part, and ſtill receives from the Duke of Cornwall annually the ſum of ſix pounds thirteen ſhillings and four-pence [z], ſo low were the tin-profits then in Cornwall, whereas in Devonſhire the tin was then ſet to farm for one hundred pounds yearly [a]. King John, ſenſible of the languiſhing ſtate of this manufacture, granted the County of Cornwall ſome marks of his favour, diſforeſted what part of it was then ſubject to the arbitrary foreſt-law, allowing it equal title to the laws of the kingdom with the other parts of England, and is ſaid to have granted a charter to the tinners (Carew, page 17), but what it was does not appear.

In the time of his ſon Richard, King of the Romans and Earl of Cornwall, the Corniſh mines were immenſely rich, and the Jews being farmed out to him by his brother Henry III. what intereſt they had was at his diſpoſal: at the ſame time the tin-mines in Spain were ſtopped from working by the Moors, and no tin being as yet diſcovered in Germany, Cornwall had all the trade of Europe for tin, and the Earl the almoſt ſole profit of that trade. This Prince is ſaid to have made ſeveral tin-laws; but matters ſoon declining into diſorder where the Prince has too much, and the ſubjects little or nothing, and the Jews being baniſhed the kingdom in the eighteenth of Edward I. the mines were again neglected, for want of proper encouragement to labour, and ſecurity to enjoy and diſpoſe of the products of that labour; which the gentlemen of Blackmoor (Lords of ſeven tithings, beſt ſtored at that time with tin) perceiving (Carew, page 17), addreſſed themſelves to Edmund Earl of Cornwall (ſon [b] of Richard King of the Romans, &c.) and obtained from him, confirmed by his own ſeal [c], a charter with more explicit grants of the privileges of keeping a court of judicature, holding plea of all actions, (life, limb, and land excepted) of managing and deciding all ſtannary cauſes, of holding parliaments at their diſcretion, and of receiving, as their own due and property, the toll-tin, that is, one fifteenth of all tin raiſed. At this time alſo, as it ſeems to me, the rights of *bounding*, or dividing tin-grounds into ſeparate portions for the encouragement of ſearching for tin, were either firſt appointed, or at leaſt more regularly adjuſted than before, ſo as that the labouring tinner might be encouraged to ſeek for tin by acquiring a property in the lands where he ſhould diſcover it, and that the farm-tin acquired by the bounder,

[z] Camden, page 5.
[a] Ibid.
[b] Not the brother, as in Gibſon's Camden, p. 4.
[c] Says Camden, page 4.

and

and the toll-tin, which was the Lord's ſhare, might remain diſtinct and inviolated. What *bounds* are has been already mentioned, p. 167, the right granted in ſuch bounds is now before us; and for the better promotion of tin-working in all waſte and unincloſed grounds, every tinner had leave to place his labour in ſearching for tin; and when he had diſcovered tin, (after due notice given in the ſtannary court to the Lord of the ſoil, and formally regiſtering the intended bounds without oppoſition or denyal) he might, and at this time ſtill may, mark out the ground in which he ſhould chuſe to purſue his diſcovery, by digging a ſmall pit at each angle of ſuch waſteral, which pits are called *bounds*; by this means he did acquire a right in all future workings of ſuch grounds, either to work himſelf or ſet others to work upon his own terms, reſerving to the Lord of the ſoil one fifteenth part of all tin raiſed therein. In Devonſhire "the tinners conſtitution (ſays Mr. Carew, page 14) enables them to dig for tin in any man's ground incloſed or unincloſed, without licence, tribute, or ſatisfaction," which infraction of common property ſhews that the conſtitution of the ſtannaries was never equitably eſtabliſhed in that county, as the ſame judicious author obſerves. Theſe pits, all bounders, by themſelves or others, are obliged to renew every year, by cutting the turf and cleaning up the dirt and rubbiſh which falls into them, to the intent that ſuch landmarks may not be obliterated. In conſideration of theſe privileges ſo granted by charter, the gentlemen tinners obliged themſelves to pay unto Edmund and his ſucceſſors Earls of Cornwall, the ſum of four ſhillings for every hundred weight of white tin, a very high duty at the time it was laid on, the tinners of Devonſhire then paying but eight pence for every hundred weight of tin; and that the payment of this tax might be the better ſecured, it was agreed, that all tin ſhould be brought to places purpoſely appointed by the Prince, there weighed, coined, and kept, till the Earl of Cornwall's dues were paid. To this charter there was a ſeal with a pick-axe and ſhovel in ſaltire (ſays Carew, page 17), as he was informed by a gentleman who had ſeen this charter, though in Carew's time it was not extant.

In the thirty-third of Edward I. this charter of Edmund ſeems to have been confirmed, and the tinners of Cornwall were made a diſtinct body from thoſe of Devonſhire; whereas before, the tinners of both counties were accuſtomed to meet on Hengſton Hill every ſeventh or eighth year to concert the common intereſt of both parties[d]. Two coinages yearly, *viz.* at Midſummer and Michaelmas, were alſo granted by this charter, and the tinners had the liberty

[d] Camden, page 26.

of

of ſelling each man his own tin, unleſs the King inſiſted on buying it himſelf [e].

A farther explanation of the Corniſh privileges and laws [f] was made by the fiftieth of Edward III. (Carew, page 17) and their liberties confirmed and enlarged by parliament in the eighth of Richard II. third of Edward IV. firſt of Edward VI. 1ſt and 2nd of Philip and Mary, and in the 2nd of Elizabeth *, and the whole ſociety of the tinners of Cornwall, till then reckoned as one body [g], was divided into four parts, called from the places of the principal tin-workings of that time, Fawy-moor, Black-moor, Trewarnheyl [h], and Penwith. One general Warden was [i] conſtituted to do juſtice in law and equity with an appeal from his deciſion to the Duke of Cornwall in Council only, or for want of a Duke of Cornwall to the crown.

The Lord-warden appoints a Vice-warden [k] to determine all ſtannary diſputes every month: he conſtitutes alſo four ſtewards (one for each of the four ſtannary precincts before-mentioned) who hold their courts every three weeks, and decide by juries of ſix perſons with an appeal reſerved to the Vice-warden, thence to the Lord-warden, thence finally to the Lords of the Prince's council.

Thus continued the tin eſtabliſhment till the reign of Henry VII, when Arthur, eldeſt ſon of that King, and conſequently Duke of Cornwall, made certain conſtitutions [l] relating to the ſtannaries, which the tinners refuſed to obſerve, and indulging themſelves in other irregularities not conſiſtent with their charters, Henry VII, after his ſon Arthur's death, ſeized their charter as forfeited; but, upon proper ſubmiſſion, by his own new charter reſtored all their former privileges, and enlarged them with this honourable and important addition [m], that no law, relating to the tinners, ſhould be enacted without the conſent of twenty-four gentlemen tinners, ſix to be choſen by a mayor and council in each of the ſtannary diviſions. This charter was confirmed by the twentieth of Elizabeth, and (it being found inconvenient that the conſent of the whole twenty-four ſhould be required) it is declared at the meeting of every convocation or parliament of tinners, that the conſent of ſixteen ſtannators ſhall be ſufficient to enact any law. Accordingly, when any more than ordinary difficulties occur, and either new laws for the better direction of the tinners and their affairs, or a more explicit declaration and inforcement of the old ones becomes neceſſary, the

[e] By the charter of Edmund therefore it ſeems as if there was but one coinage in a year, and the tinner could not ſell without leave firſt obtained.

[f] Particularly recited in Plowden's Commentaries, page 327, Camden's Annotat. page 4.

* Pearce, page 49.

[g] Camden, page 4.

[h] Alias Tywarnail.

[i] By theſe ancient charters (Carew 18); by Edward III. ſays Camden, page 5.

[k] Not a Sub-warden over every company, as in Camden, page 5.

[l] Camden, page ib.

[m] By which charter [viz. of Pardon] he farther granted, ſays the editor of Camden, page 6.

Lord-

Lord-warden, by commiſſion from the Duke of Cornwall, or from the Crown, if there be no Duke [n], iſſues his precept to the four principal towns of the ſtannary diſtricts, *viz.* Lanceſton for Fawy-moor, Loſtwythiel for Black-moor, Truro for Trewarnheyl, and Helſton for Penwith. Each town chuſes ſix members, and the twenty-four ſo choſen, called Stannators, conſtitute the parliament of tinners. In the reign of Elizabeth, Sir Walter Raleigh being Lord-warden, the tinners perceiving that by the charter of Henry VII. no law could be enacted, unleſs the full number of twenty-four ſtannators concurred *, propoſed that twenty-four other ſtannators ſhould be choſen, ſix at each of the tin-courts holden for each ſtannary, returned by the ſteward and added to the former number, in order to make forty-eight members; and that the majority of that number, or as many as ſhould aſſemble of that number, ſhould be enabled to make laws: This propoſal did not take effect; but in the twenty-ſixth of Charles II. 1674, ſome terms and claims inſiſted upon by the Crown meeting with great oppoſition, the ſtannators, being under difficulties, named to the then Vice-warden ſix perſons for each ſtannary, and deſired they might be ſummoned by the Vice-warden to meet and conſult with that convocation †. Since that time it is uſual, but not neceſſary, for every ſtannator to name an aſſiſtant, and the twenty-four aſſiſtants are a kind of ſtanding council, and aſſemble in a different apartment, and are at hand to inform their principals of calculations, difficulties, and the ſtate of things among the lower claſs of tinners, ſuch as the ſtannators might not otherwiſe be ſo well acquainted with. The ſtannators, for the more orderly diſpatch of buſineſs, chuſe their ſpeaker, and preſent him to the Lord-warden to be approved. Whatever is enacted by this body of tinners, muſt be ſigned by the ſtannators, the Lord-warden, (or his deputy, the Vice-warden who preſides in his abſence) and afterwards either by the Duke of Cornwall or the ſovereign; and when thus paſſed, has all the authority, with regard to tin-affairs, of an act of the whole legiſlature.

The preſent Lord Warden is the Right Honourable Earl of Waldegrave.

Reverend Walter Borlaſe, L L. D. Vice-warden.

The preſent ſtannators of the tin-parliament, continued by adjournment and prorogation, are, for the

Stannary of Fawy-moor,

Sir J. Moleſworth of Pencarrow, Baronet.

Sir J. St. Aubyn of Clowance, Baronet.

[n] The eldeſt ſon of the King is Duke of Cornwall, without grant or inveſtiture; but if this ſon dies, and leaves children, his eldeſt ſon cannot be Duke of Cornwall without grant, but the title remains in the Crown.

* See page preceding. † Mr. Hawkins's MS.

John Harris of Hayne, Eſq;
James Buller of Morval, Eſq;
Richard Vyvyan of Treſmarrow, Eſq;
John Sawle of Penrice, Eſq;

Stannary of Black-moor,
Honourable Richard Edgcumb Eſq;
George Hunt of Lanhydrok, Eſq;
William Trevanion of Caerhayes, Eſq;
Philip Raſhleigh of Menabilly, Eſq;
Thomas Hawkins of Trewithen, Eſq;
Nicholas Kempe of Roſteag, Eſq;

Stannary of Trewarnheyl,
Honourable Edward Boſcawen.
Honourable John Boſcawen.
John Enys of Enys, Eſq;
William Lemon of Carclew, Eſq;
Richard Huſſey of Truro, Eſq;
Reverend Thomas Hearle, A.M. Vicar of St. Mich. Penkevil.

Stannary of Penwith and Kerrier,
Honourable George Boſcawen, Eſq;
Robert Hoblyn of Nanſwydn, Eſq; ſpeaker, deceaſed.
Reverend Walter Borlaſe of Caſtlehornek. L L. D.
Chriſtopher Hawkins of Trewinard, Eſq;
Ed. Elliot of Port Elliot, Eſq;
John Rogers of Treaſſo, Eſq;

CHAP. XIV.

Of Iron found in Cornwall.

IN the reign of Queen Elizabeth there were no iron-mines, it is ſaid, in all England [o], excepting Gloceſterſhire, and thoſe not diſcovered many years before; but this was not for want of iron, neither could the diſcovery of theſe mines be the firſt, for we have undoubted proofs that the Romans wrought iron-mines in England, many Roman coins freſh and rough being found under large heaps of cinders which were, and are ſtill, wrought over again for iron with good profit, the firſt melters having not ſufficiently extracted the metal from the ore [p]; and it now appears, that we have numbers of iron-lodes in ſeveral parts of England. There are many in

[o] See Dr. Muſgraves Antiq. vol. I. page 156.

[p] Walker's Dedication to his Account of coins.

Cornwall,

Cornwall, as in working for tin we often find, and, by the great number of chalybeate ſprings, may juſtly infer [q]; but not one that I have heard, or can learn, worked as yet to effect, although in ſome of them the ore is very rich, and near the ſurface. The truth is, the Engliſh iron-works are not only ſupplied with this ore in great plenty from the foreſt of Dean in Gloceſterſhire, but there are many rich iron lodes in Lancaſhire, Cheſhire, Suſſex, and Derbyſhire, and other parts of England. In Staffordſhire Dr. Plot (page 159) obſerves, that there is an iron-ore, called Muſh, ſo rich and fuſible that it may be made into iron in a common forge: in Wiltſhire alſo they have an iron-ore of equal richneſs [r]; nay iron is not only found in lodes in many parts of the earth, but, when the lodes have been exhauſted, the iron is in ſome places ſo collected and renewed from the neighbouring *ſtrata*, (this metal being eaſily ſuſpended, carried of, and depoſited by common water) that a certain mine in Tuſcany, after it is wrought out, becomes, in the ſpace of three years, as pregnant with iron as it was before [s]. There being ſuch an abundance of this moſt uſeful metal elſewhere, it is not likely that there will be any demand ſoon from other parts of this iſland for the iron-ore of Cornwall, neither can the Corniſh entertain any reaſonable hopes of manufacturing it in their own county, at leaſt till wood for making charcoal becomes more plenty with them than it is likely to be for ſome generations; and if there were wood ſufficient, it is no eaſy matter to ſet on a manufacture of this kind. This however is no ſenſible diſadvantage to the county in general, our tin, copper, huſbandry, and fiſh, with the neceſſary branches of trade dependant thereon, finding great employ as they are managed at preſent, and with ſome improvements (which might be eaſily introduced) would find ſtill more; ſo that, till theſe reſources fail, we ſhall be under no neceſſity of working our iron lodes; but it is worth our while, in the mean time, to acquaint ourſelves with the nature of them better than perhaps we are at preſent informed; for if any iron lode is of a richneſs equal to that mentioned before, it may prove very profitable to the owner, even as matters now ſtand, eſpecially if ſo near the ſea that it may eaſily be exported coaſt-ways to Briſtol and the river Severn, to which places ſhips are frequently obliged to go without lading. Again: In iron-mines a kind of ocre is often found, valuable according to the different degrees of its purity, and much uſed by painters; and if this happens to abound, it will well reward the miner for raiſing it, the beſt we have at preſent coming from France.

[q] Iron is found in the pariſhes of Morvah, Piran-ſand, Lanivet, Gwynear, St. Die, Temple, at the Lizherd-point, &c. Woodward's Cat. vol. II. page 37—vol. I. page 232, &c.

[r] Grew's Muſ. page 331.

[s] Phil. Tranſ. 1740, page 89.

When

SECT. II. Shapes.

When iron forms by dropping from roofs and ſides of caves, it becomes a lump of tubular parallel ſtems which hang ſide by ſide in the ſame manner as the mundics, Plate XVI. page 141, Figures XXXIV, XXXV. and copper, Plate XXI. Fig. IX. and is called Bruſh-ore. Sometimes it is found in the form and ſize of muſket bullets[t], Plate XX. Fig. XXXI. page 186, each of which is fixed in its nidus, but never detached and perfectly globular, as far as I have yet ſeen. Dr. Grew (Muſ. R. S. page 332) mentions iron balls made by the rolling of iron-ſand off the banks among the iron-mines near Senneck, eſpecially after rain; but theſe here are natural from the mine. Sometimes it is bliſtered into round tubercles, as Plate XV. Fig. IX. page 137, and Plate XXI. Fig. III. at other times made into the exact ſhape of a button, protuberant in the middle, and declining on every ſide into a variety of polygonal planes, as Fig. XXXII. Plate XX. In both theſe laſt caſes it is called the Button-ore. Iron is ſaid to give the rhomboidal form to cryſtals[u]: if this be true, it may alſo do the ſame to mundics; but, as the rhomboidal form is not peculiar to iron, the queſtion will ſtill remain undecided, whether one and the ſame mineral ſalt may not give this figure to them all, and be no more the proper conſequence of iron than of the other foſſils. This ore is ſometimes found in Cornwall, near Truro, conſiſting of parallel plates which break into very ſhining and gloſſy ſurfaces[w], and a coarſe falſe kind of iron-ore, called Kal, is found in moſt parts of Cornwall; this laſt promotes the fuſion and toughneſs of tin, eſpecially where mundic abounds; for the mundic by itſelf will ſcarce permit the tin in many places to be at all ductile: the truth is, the Kal connects the metallic parts, whereas the ſulphurs of mundic have a quite contrary effect, and render them volatile.

CHAP. XV.

Of the Copper found in Cornwall.

THIS ſupple, rich, and uſeful metal, Cornwall has for ſome ages been reckoned to have been plentifully ſtocked with[x], but it has never turned out any conſiderable profit to the owners of the land till within theſe ſixty years; ſo little does diſcovery ſignify, unleſs it be purſued with application, and knowledge how to make the proper advantage of it. At preſent it may be aſſerted

[t] As in Huel-an-boys, in St. Juſt.

[u] Woodward's Cat. vol. I. page 220. Hill, page 197.

[w] Woodward's Cat. vol. II. page 86.

[x] See Carew's Survey, page 7. Norden, page 9, 41, 42, 104.

with

with great ſecurity, that there is no richer copper, nor a greater variety of ores any where than in Cornwall.

SECT. I. In what ſtate found.

Copper is found ſometimes depoſited on the ſides of fiſſures in thin films, which are no more than the ſediment of waters iſſuing from ſome copper lode; ſometimes in ſpots and bunches irregularly diſperſed, but moſtly in fiſſures, in like manner as the tin-lodes.

Copper lodes throw from them few ſhodes, ſo that they are not often acceſſary to their own diſcovery; the reaſon of which is, that there is ſeldom any copper on the back of the lode, ſo as to conſtitute a *broil*; but when there is, and that copper is heavy, and promotes its own removal downwards by its gravity, copper lodes throw ſhodes as well as thoſe of tin, of which ſeveral inſtances might be produced.

Veins of copper are oftentimes by the ſedulous diſcovered in cliffs, where they are laid bare by the ſea, copper being much eaſier diſcerned than tin. The moſt encouraging leader to copper is what the Corniſh call Goſſan, which is an earthy, ochrous ſtone, ruddy and crumbling, like the ruſt of iron. Where the ground is inclinable to an eaſy, free, blue killas, intermixed with white clay, the miners think it a promiſing ſymptom. A white cryſtalline ſtone is alſo reckoned very retentive of yellow copper. The ore does not lye at any one certain depth; but it is a general rule, that when copper is found in any lode, that lode ſhould be ſunk upon, it generally proving better at ſome depth, than when it is firſt touched.

SECT. II. Ores ſorted by their colours and texture.

That ore which is moſt common is of a yellow braſs-colour: it is found adhering to ſtones of all kinds, but pureſt commonly in the white opake cryſtal, or in the white clay, and according to the quantity of the barren ſtone intermixed, ſells from five to fifteen pounds *per* ton. Of this yellow ore there are different ſorts: ſome not only looks like mundic in texture, but is ſhaped into cubes (as the yellow mundic generally is) and will bear *aqua fortis* without ſtirring, and yet has been found to be real copper-ore, and worth eighteen pounds *per* ton; but the beſt ſort of yellow is the flake-ore, called ſo from the cloſeneſs of its texture, which is as ſmooth and gloſſy as braſs, and not more porous: this ſort is not ſo brittle as the former yellow, and has undergone the purification of a *menſtruum*, being probably no more than the firſt-mentioned common yellow diſſolved and depoſited in the mine: it is found commonly in thin, viſibly diſtinct, ſtratous maſſes, with its under parts of a bliſtered buttony ſurface, (Plate XXI. Fig. III.) according as the drops of the ſolution fell from different parts of the roof (Plate ib. Fig. II.). Where the ſolution is viſcous and leſs diluted, it forms tubular

ſheaths, one without another, like the ſtalactites, from the bigneſs of a thread to a cylinder of two inches diameter [y].

SECT. III. Green ore. Of the green coppers, ſome are as light as a feather, being meer *ærugo*, or verdegris [z]; ſome more ſolid and ſtony, little metal in either; ſome a thick incruſtation of a deep velvet green. One ſample is very ponderous, (Fig. XIII. ib.) nothing of ſtone or ruſt appears, the texture conſiſting of ſmall ſhining *ſtriæ*, parallel, gloſſy as ſatin, extremely rare. It appears to be a ſolution of copper which diſtilled its gloſſy filaments upon a thin ſhell of the fineſt flake-ore, part of which caps this ſpecimen ſtill at *a*, *b*.

Of the green-coloured there is alſo a flaky kind of cloſe contexture, ſometimes cohering in tubes as it drops, (N°. XI. ibid.) but forming a richer, cloſer, and more poliſhed ſurface ſtill when it gets free (as Fig. X. XIV, XV.) which is perhaps one of the moſt curious productions of the copper kind. It is of two ſorts, the rich, deep green, and the pale blue; the firſt much the more precious and beſt formed, prettily clouded, ſets well in rings, but whether it may be reckoned a gem of the turcois kind, as has been already obſerved among the gems, page 116, I will not aſſert N°. X. came from Mr. Baſſet's work called the Pool *, the others, XIV, XV. from Lord Godolphin's mine in Ludgvan, called Huel-fortune.

SECT. IV. Blue ore. Beſides the pale flaky blue mentioned above, I have likewiſe a blue earth of an extremely fine and ſmall grit, but the greateſt quantity I ever ſaw does not exceed the bigneſs of a bean: this curious earth is likely thrown away, becauſe it appears in ſuch little quantities as nature generally diſtributes her moſt precious gifts in. I have had it from two places, from the Pool, and the other, uncertain. Of the *lapis lazuli* I have never yet ſeen any found in a Corniſh copper-mine, but this gritty blue is as it were the powder of it, and ſeems a kind of that precious ſtone incomplete, and not ſufficiently hardened.

SECT. V. Grey ore. The grey-ore is often prettily ſpotted with yellow and purple, but the more of this mixture the leſs is its value. When it is of an uniform lead colour throughout, it is richeſt, and contains a great deal more metal than the yellow or green, being worth between fifty and ſixty pounds *per* ton.

SECT. VI. Black ore. Copper appears ſometimes as a blue-black earth, of an indigo colour, very light, interlaced with an opake baſe cryſtal. Mixed with

[y] Fig[s]. V, VI, VII, VIII, IX. XI. Pl. ib. p. 200.

[z] Theſe *Ærugo's*, viewed in a microſcope, appear to be cluſters of cryſtals of various colours, according to the ſalts which produced them. Boerh. The. of Chem. Engl. page 88.

* Plate XVIII. page 169.

water

water it is a rich blue, but with nut or poppy oil it makes a deep ivory-black. Beſides this black grit, there is a more ſolid kind of black copper-ore, very ponderous; it is bliſtered into large tubercles, by which it appears, that it is a ſolution of copper concreted in a bed of ſulphur, and covered over with a glaſſy, ſparkling cruſt [a]: it may poſſibly be worth while for thoſe who prepare paints by fire, to try whether ſome valuable blue colour, ſuch as Pruſſian blue or *ultra-marine*, may not be extracted from the blue grit, Section IV, and thoſe two black copper earths.

SECT. VII. Red ore.

The red-ore mixed with glaſſy ſpeckles (the cryſtallized ſalts of this metal) is called the fire-ore; it riſes generally in ſmall, detached glebes from a bed of coarſe ochre, and the ferrugineous *rubrica*, covered at times with a cruſt of lapideous green copper; ſome of it is a ſolution, as by the bliſtered granules appears; ſome the natural ore; it is very ponderous, and more valuable than any of the reſt. Some ores of this colour break into ſhining ſurfaces, and reſemble ſo much the ores of ſilver, that ſcarce any one can diſtinguiſh the largeſt grains of this ſort from the *argentum rubrum* of Andreaſberg in Hanover, which contains betwixt eighty and ninety parts of an hundred of ſilver, the waſte flying off, being meer arſenick. This beautiful and rich ore is never ſaved ſeparately from the reſt, although it promiſes ſo fair for ſilver. It was ſuppoſed by ſome gentlemen at Leyden, to whom I ſent a large ſpecimen, cloſe-grained and ſolid, that it contained much zink.

SECT. VIII. Malleable ore.

The moſt perfect copper, from which the before-mentioned are only ſo many inferiour and different removes, is the Malleable (from its purity called in Cornwall the Virgin-ore) which, in ſmall quantities at leaſt, is found in all the moſt conſiderable copper-mines. It is variouſly combined and allayed; ſome with baſe cryſtal (granulated) intermixed; ſome with goſſan, ſome with white gravelly clay, ſome in ruddle and the ruſt of iron; in ſhape very various, ſometimes thin ſpread, and ſhaped like leaves, now like drops and boſſes, now branched, fringed, or twiſted into wires, in hollow filagree, in blades and daggers, now in powder little inferiour in luſtre to that of gold; ſometimes bliſtered, at other times a congeries of combined granules; but which is the fineſt of all, ſometimes in ſolid lumps (as the Mullion copper) of ſeveral pounds weight, maturated, unmixed, and highly poliſhed.

SECT. IX. Explication of the figured coppers, Plate XXI.

Fig. I. Virgin-ore, ſomewhat bliſtered; it has ſeveral little columns at *a*, croſſing each other like bones, with knobs or bunches

[a] A very rare ſpecimen from the Pool.

at

at their ends: at their interſections they make unequal angles, and therefore could not be of the ſtalactite kind. Its colour is like manufactured copper before it is poliſhed.

Fig. II. The upper face of a flaky braſs-coloured ſpecimen; its ſurface beſet with circular *laminæ* growing leſs towards the top, ſhewing that drops of this metal falling from above, were at firſt large, and ſpread into the broadeſt *laminæ*; a ſmaller drop ſucceeded, and falling on the ſame centre, hardened into a leſſer circle, and ſo on, the circles being as many as there were drops. Some have five *laminæ* on one another, as *b*, *c*; others two, three, and four, large in proportion, and in number equal to the drops which fell. This rare ſpecimen ſhews how the flaky ore is formed, namely, by diſtillation. *N. B.* The under part is bliſtered into large tubercles, as in the following ſample.

III. The bottom of flake-ore bliſtered by diſtilling into a ſoft bed, (likely of ſulphur) each drop making a convexity.

IV. Braſs-coloured flake-copper, ſmall-bliſtered, depreſſed on the ſurface into five concave cells, divided by plain partitions.

V. Braſs-coloured, powdered with blue earth, the top divided into two cylinders, below which, from a wreathed edge, the filaments are perpendicular, in the fungite manner.

VI. Braſs-coloured; the filaments courſing tranſverſely at right angles with one another; it is powdered with a blue little inferiour to the *ultra-marine*.

VII. A conic cluſter of wreathed threads, braſs-coloured, curiouſly interlaced, in ſome parts detached from the main body like hollow carved-work, incruſted with a beautiful cinereous film, the ſurface rather of a fine grit than ſmooth and gloſſy.

VIII. An hexagonal tube of flake-copper, its perforation filled with the ſame ſolution, girt round with a continued bandage of bliſtered flake-ore.

IX. Bruſh copper-ore, in parallel tubes, of a duſky brown colour.

X. A ſolid piece of the fineſt green; its texture conſiſting of different *ſtrata* of greens, large bliſtered, probably the *malachites* of authors.

XI. Leſs ſolid green, of a gloſſy coating, formed into tubes, braced with vermicular rings like the joints of a caterpillar; the outer tubes have an inner one incloſed, the perforation ſmall as the point of a needle.

XII. Solid, gloſſy, green, branchy.

XIII. Green; the filaments as fine and gloſſy as the pile of velvet, armed with a thin ſhell of bliſtered flake-ore, on which are formed three parallel circular determinations of the deſcending *ſtriæ*.

Fig.

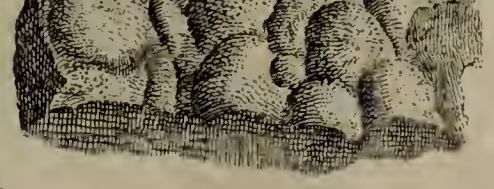
PL XXI.

FIGUR'D COPPERS, Explaind pa: 200.

I

II

III



IV

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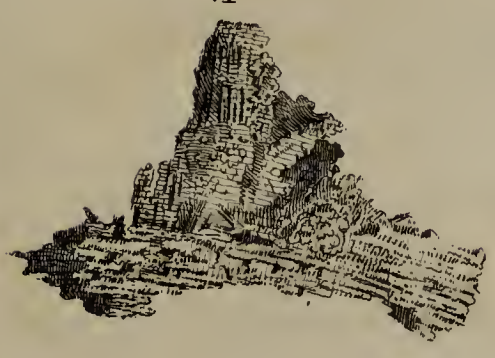
VI

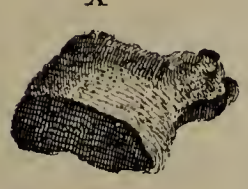


VII

VIII

IX

X



XI

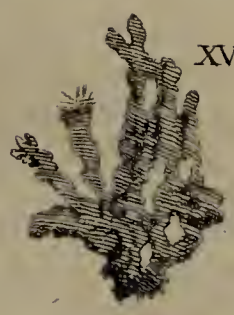
XII

XIII

XIV

XV

XVI

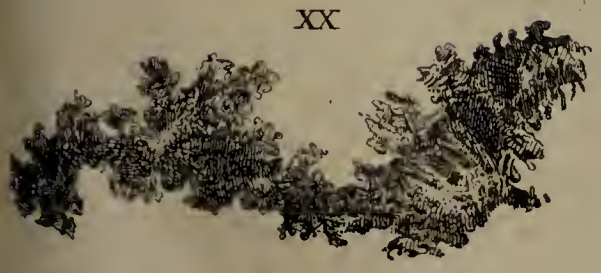


XVII

XVIII

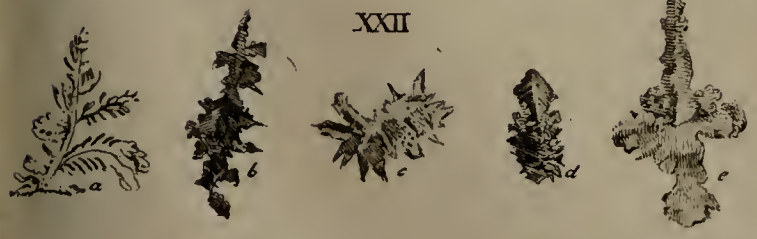
XIX

XX



XXI

XXII



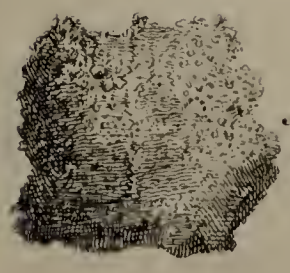
XXIII

XXIV

XXV

End view of a piece of Gold nat: size.

XXVI



Side view of the same.

To the Right Rev.d George Savington Lord Bishop of Exeter; this variety of Coppers is with great duty & respect inscribed by Wm: Borlase.

Fig. XIV. The ſmooth, ſolid, high-bliſtered copper, (ſection III. page 198) from Huêl-fortune in Ludgvan, the moſt pure and beautiful of the green kind.

XV. The ſame ſort, mamillary with a drop at the bottom, formed probably in a pendulous poſition.

XVI. Virgin leaf-copper, branchy.

XVII. Ditto.

XVIII. Ditto.

XIX. Virgin-ore branched, and fibrous like the anatomy of a leaf.

XX. Virgin-ore, fringed at the edges.

XXI. This elegant ſpecimen of virgin-ore run into hollow filagree, conſiſting entirely of ſo many branchy filaments, terminating in little aſtroite tufts, and the ends of the branches tipt with *papillæ*, all of pure copper, came from the Tolvaen copper-work in the pariſh of St. Juſt, Penwith, 1754 [b].

XXII. Brighteſt virgin-ore ſhot into daggers, *cuſpides*, branches, and ſprigs, as *a*, *b*, *c*, *d*, *e*.

XXIII. The pureſt virgin-ore from Mullion formed into drops.

XXIV. D°. ſpread into regular leaves, and bunchy.

The two laſt ſpecimens are of the richeſt, moſt ſparkling, and beſt naturally poliſhed copper-ore which any mine affords; ſome years ſince it was raiſed in the pariſh of Mullion in large lumps of ſeveral pounds weight, one lump of it weighing forty pounds: what heightens the beauty of this ore is this, that in moſt places it is enamelled with that green flaky *ærugo*, which age alone gives to coins and medals, and art in vain endeavours to imitate.

Copper covets not geometrical or angular figures.

SECT. X. Why malleable copper, and of ſo many ſorts from the mine.

It may ſeem a little ſurprizing that we ſhould find copper native and malleable ſo much more frequently than any other metal, and in ſuch a variety of colours and ſhapes. The reaſon is this: Copper in the mine is more eaſily diſſolved and ſtripped of its ſtony *involucrum* than any other metal: it is ſoluble by all the ſalts known, both acid, alkaline, and nitrous [c], nay even by common water, and in ſome ſtates by the air itſelf. What makes it yield ſo to almoſt every fluid, is, that there is little ſtone, but much vitriol incorporated with copper; and vitriol, being no other than a free ſoluble ſalt, is always ready to mix with every kind of moiſture which attempts it. Hence it comes to paſs, that copper is frequently liquified in the earth, and every time the vitriol melts, and becomes ſuſpended, the incorporated copper deſerts its *primæval* bed of ſtone, and when it becomes too heavy to be born along by the fluid vehicle, diſtills from

[b] This ſeems to be what the Spaniards in their Peruvian mines call Machacado. Alonſo Barba, page 85.

[c] Boerh. page 88.

higher into lower parts of the mine, ſticks in tubes ſide by ſide, or forms into thin leaves or fringes in the chinks of the rock, floats into horizontal *laminæ* on plane ſurfaces, or is detained and formed by the hollows which it ſwims into.

Let it be obſerved in the next place, that when the *menſtruum* is different, the ſolution of copper will be ſo too, and will be more or leſs pure according to the quality and power of that *menſtruum*. If iron (which is a magnet to copper) interferes, the vitriolic fluid depoſites the copper, and moſtly in granules, corroding at the ſame time, imbibing and carrying off the iron, by which it is attracted more forcibly than by the copper. Again: There being ſo many *menſtrua*, and the concretions of copper ſo ſoluble, the metal muſt undergo ſometimes a great many ſolutions in the mine; and as every diſſolution muſt depoſit ſome *fæces*, the metallic glebe conſequently becomes proportionably the more pure the oftner it is diſſolved. This obſervation may lead us to account for the different ſtates and degrees of purity which we find in the ſolutions of copper above-mentioned. The yellow, flake, braſs-coloured copper, (Section II.) is a ſolution, as appears not only from its frequently bliſtered bottom, as Fig. III. Plate XXI. but alſo for that the plain ſigns of the drops, as they fell and concreted on each other, are evidently to be ſeen at *b*, *c*, in Fig. II. ibid; but by reaſon either that the *menſtruum* was not forcible enough, or that this and ſuch like was the primary and only ſolution, theſe ſpecimens have neither the ductility, nor colour, nor weight of the malleable ore; they retain more of the arſenical ſulphureous ſtate of the common yellow ore, and are indeed but one remove from it. In other ſolutions, as particularly in the red bliſtered ore, we find a further degree of puriſication, owing to a more powerful *menſtruum* or reiterated ſolution, or both, till at laſt the metal becomes thoroughly maturated, that is, as ductile, and free from ſtone, ſulphur, and ſalt, and as brilliant in colour, as fire itſelf can make it, which indeed is the caſe of the Mullion copper *. Again: The different *menſtrua* not only defecate the ores of copper, but alſo impart various colours to them. Acids will make copper green, *alcalies* will make it red, *ſal armoniac* and the intermediate ſalts will give it a blue caſt [a]. Theſe *menſtrua* again being reduced and qualified by one another, will give it the grey, black, and purple dies, whence ariſes the great variety of colours ſo conſpicuous in theſe ores; but when the *menſtrua* are clear and forcible, they borrow from the copper, and impart the moſt piercing dyes to precious ſtones, making the *lapis lazuli*, the ſapphire, emerald, amethyſt, beryl, and other gems.

* Sect. VIII. page 199.

[a] Hiſtory of Waterford, page 304.

As

SECT. XI. Of raiſing, ſorting, and dreſſing the copper ore.

As to the mining part, copper-works do not differ from thoſe of tin materially, but the method of dreſſing or preparing the metal for ſale is very different. To ſeparate the good ore from the bad with greater advantage, certain overſeers [e] are appointed to ſuperintend the labouring miners, and ſee that all the richer ſorts of ores be kept together in the bottom, then raiſed as unmixed as may be, and laid forth on the graſs in diſtinct heaps; and becauſe there will be ſome waſte in breaking, the ore is taken out of the lode, and brought to graſs in as large lumps as the tackle of the engine will muſter [f]. What comes from the people below, is reexamined as ſoon as it arrives at the mouth of the ſhaft; the beſt is broken ſmall with hammers, which they call Spalling, or brought away to the adjacent bucking-mills, where there are men ready to bruiſe it upon a rock with a ſhort bar of iron, and thence carried to the heap of beſt ore, and what is not worthy of the firſt place, is laid by to make another ſortment; the beſt ſmall ore (which conſiſts of the ſmaller fragments of what has been broken and ſorted before) is then waſhed and ſifted into a tub or keeve as near to the ſhaft as poſſible (to prevent waſte), firſt through an iron ſieve or ſearce, called in Cornwall the Griddel, the meaſhes about half inch ſquare; here the waſte, or barren ſtone, by waſhing is diſcovered and thrown away, and what has copper in it ſorted into *beſt*, and *dredged*, (that is, ſtreaked, ſpotted, powdered ore, which requires a ſecond waſhing) and the larger pieces of ore of each ſortment are thus divided; what paſſes through the griddle, is taken up out of the kieve, and put through another ſearce of ſmaller meaſh, called the *jigging* ſearce, which has eight holes in every ſquare inch; here, when it has been lifted up and down, and turned round in the ſearce a few times (which they call *jigging*), the waſte will all riſe to the top, and ſettle in the middle like ſmall ſand, and what remains underneath will be clean ore. The poorer ſort, which is the ſtreaked or dredged ore, is carried from the mine to the next adjoining ſtream of water, where in ſeveral pits made for that purpoſe, called the *ſtrakes*, it is waſhed clean; all the richeſt bits of ore are then culled from the reſt by girls or boys at the hire of four-pence *per* day, and the pooreſt or moſt ſtony parts, which are not fit to be put with the picked ore, are carried to a ſtamping-mill, there pounded, and paſſed through a rough grate [g]; what ore reſts in the forepart of the pit, F, Fig. III. Plate XIX. is carried back to the *jigging* ſearce and worked as before-mentioned; but what runs off to the hinder-

[e] Called Under-ground Captains.

[f] July 12, 1743, I ſaw a large rock of copper taken out of a lode in Clowance wood, which weighed 1275 pounds weight: they endeavoured to raiſe it entire by the *whim*, but the beam breaking, the rock alſo broke in two parts, and the pieces were then brought up.

[g] See ſtamping of tin, ch. xv. ſect. xvii. p. 178.

moſt

moſt part of the pit, F, and remains there, and in the ſecond pit, G, is ſlimy, and muſt be *trunked*, *buddled*, and *tozed*, as the ſlimy tin [h].

This is the preſent method of dreſſing copper, which employs many hands; and yet in works which throw up a quantity of ore, it is all broken, raiſed, ſized, waſhed, picked, ſtamped, and ſorted into particular heaps for one tenth part of the whole produce when ſold, and ſometimes for leſs.

SECT. XII. Method of ſelling copper in Cornwall.

A quantity being ſorted, cleaned, and divided into heaps, according to the quality of the ores, the agents for the copper-companies of Wales and Briſtol (who reſide at Truro and Reddruth) upon notice given, attend to *ſample* the ore, and each ſampler having taken from each pile as much as is ſufficient for aſſaying and aſcertaining the value of that pile, a day is appointed by joint conſent of the ſeller and buyer, at ſuch diſtance as may give the ſampler time to repeat and verify his aſſays, for the ſale of the copper: on the fixed day each of the ſamplers attends, and produces a ticket, or written paper, ſealed up, in which is expreſſed the price which each ſampler will give for the ore: he, who in his ticket bids moſt, has the ore [i]. This way of ſelling has obtained about thirty years, and muſt be a very fair way of dealing provided the agents do not in concert conſult one another's conveniency in buying (which perhaps is no more than every buyer thinks he has a right to do) rather than the juſt value of the ore; provided alſo, that they do not divide the parcels occaſionally, ſo as that no buyer may have reaſon to complain, and remonſtrate; that they do not groundleſſly ſuggeſt an exorbitant fall of the price of copper which the owner cannot contradict; provided alſo, that theſe agents do not combine to diſtreſs and reduce the copper of a reluctant and too inquiſitive miner. Such complaints are muttered, but with what grounds I pretend not to decide. If, beſides this, the agents for the companies ſhould combine, and refuſe to admit the tickets of any perſon whatever, who had a mind to offer for any parcel of copper, it would juſtly increaſe and give weight to theſe ſuſpicions: neither can theſe companies blame the preſent generation, if they be ſomewhat uneaſy; people who have wares to ſell, of which they know not the value, (which is the caſe of the owners for the moſt part) have been ſuſpicious in all ages of their being impoſed upon at the time of ſale: this is no where more evident than in the caſe before us. My buſineſs is hiſtory, not traffic, and I ſhall meddle with the

[h] See before, pages 178, 179.

[i] It muſt here be obſerved, that if the aſſayer offers only according to the product of his aſſay, he offers much ſhort of the real price, "it being well known from the laws of attraction, that a large portion of ore will yield more in proportion than a ſmaller quantity." See Smith's ſtate of the county of Kerry.

latter

latter no further than is neceſſary to illuſtrate the former. The richneſs of our copper-works is not a late diſcovery, but indeed the application of the Corniſh to work them effectually, is not ſo old as the preſent generation; the reaſon moſt obvious is, that thoſe who beſt knew the value of theſe mines, made it a part of their trade to conceal it. Mr. Carew (in the reign of Elizabeth) hints at the little profits made in Cornwall from copper, and aſſigns them to the ſearcher's being kept in ignorance by the merchant. "Copper is found, ſays he, (page 7, firſt edition) in ſundrie places; but to what gain to the ſearchers, I have not been curious to enquire, nor they haſty to reveal: for of one mine, of which I took view, the ore was ſhipped to be refined in Wales, either to ſave coſt in the fewel, or to conceal the profit." Mr. Norden, 150 years ſince, ſeems to have had full information that the Corniſh copper-mines were rich, and therefore in his letter to King James I[k]. like a faithful ſervant, (ſurveyor as he was to the then Prince of Wales) intimates the expediency of a better inſpection into the ſtate of thoſe mines, and ſurmiſes the arts by which the value of them was concealed. "So rich are the works (ſays he, ibid.), eſpecially ſome lately found, as by the opinion of the ſkilful in the miſtery the like have not been elſewhere found, though the worth hath been formerly extenuated by private pryers into the ſecret, and covertly followed for their own gain." Notwithſtanding theſe hints, I do not find any thing material going on here in Cornwall, as to the improvement of the copper-mines, till, about ſixty years ſince, ſome gentlemen of Briſtol made it their buſineſs to inſpect our mines more narrowly, and bought the copper raiſed for two pounds ten ſhillings *per* ton[l], and ſcarce ever more than for four pounds *per* ton. It muſt be obſerved, that the yellow ore, which now ſells for a price between ten and twenty pounds *per* ton, was at this time called *poder*, (that is, duſt) and thrown away as mundic. The gains were anſwerable to their ſagacity and diligence, and ſo great, that they could not long be kept ſecret; this encouraged other gentlemen of Briſtol, about forty years ſince, not only to buy copper at a low rate[m], but to engage as adventurers in ſome old mines; and at this time Mr. John Coſtar, a gentleman well ſkilled in metals, judicious, and particularly knowing in mechanics and hydraulics, undertook, by means of a water-engine, (either of his own invention, or at leaſt improvement) to drain ſome conſiderable mines with ſucceſs: he taught the people of Cornwall alſo a better way of aſſaying and dreſſing the ore.

[k] See Norden's Survey of Cornwall, page 104.

[l] At N'uun-vian in Piranuthno, and at Mr. Uſtick's works in St. Juſt.

[m] Mr. Beauchamp of Gwenap at this time covenanted to ſell all the copper which ſhould riſe out of a mine well ſtocked, for twenty years, at five pounds *per* ton, and the ore at Reliſtian in Gwinear was covenanted for at two pounds ten ſhillings *per* ton.

Here may we date the advance of the price of copper and improvement of copper-mines; for though this gentleman was frequently purchaſer of the whole product, as well as director of all the mining part, (as indeed he well deſerved to be) and by this means could the better, and not unjuſtly, conceal his profits; yet the copper could not be ſorted, dreſſed, and weighed, and ſometimes ſeparately ſold, without the real value tranſpiring in ſome meaſure. By degrees the Corniſh dreſſers of copper-ore grew informed nearly of the value and proper management of the ore, and at preſent a great many aſſay it.

The copper being thus ſold to the agents of the copper-companies in Wales and Briſtol, is ſhipped off for thoſe places to be melted and refined.

SECT. XIII. Mines and their revenues yet improveable.

The firſt and greateſt copper-mines which have turned out conſiderable profits within theſe forty years, are the following:

Chace-water, in the pariſh of Kenwyn (*a*); North Downs, in Reddruth (*b*); Huel-rôs, in St. Agnes (*c*); Roſkaer and Huel-kitty, in Camborn (*d*); Huel-fortune, in Ludgvan (*e*); the Pool, in Illogan (*f*); Dalcooth, Bullen-garden, Entral, Longcloſe, in Camborn (*g*); Metal works, in Gwenap (*h*); Trejeuvyan, in Gwenap (*i*); Binner Downs and Clowance Downs, in Crowan (*k*); Huel-cock and Roſmoran, in St. Juſt (*l*); and Herland mine, in Gwinear *: But the greateſt and moſt ſudden gain produced by any copper-work which I have yet heard off, and as far as the memory of man reaches, was that of Huel-virgin, in the pariſh of Gwenap, in July and Auguſt 1757. In the firſt fortnight's working, it threw up copper ſold for five thouſand ſeven hundred pounds; in the next three weeks and two days, as much copper as ſold for nine thouſand ſix hundred pounds: to raiſe the firſt-mentioned quantity, it coſt the adventurers no more than one hundred pounds; to raiſe the ſecond, a trifle more in proportion to the quantity.

All theſe either are or have been of late years very profitable works; and beſides the many thouſand pounds annually returned to the Lords, (their dues being generally one fifth part of the whole produce clear of all expence, never leſs than one eighth clear) great fortunes have been raiſed to adventurers, and there are ſeveral other gainful though leſs conſiderable mines now in working, ſo that the annual income to the county from copper equals very nearly at

Lords of the Soil are

(*a*) Lord Viſcount Falmouth.
(*b*) Sir John St. Aubyn, Baronet, and John Nance, Eſq;
(*c*) Thomas Heyes, Eſq;
(*d*) Samuel Percival, Eſq; late Sir William Pendarves, Knight.
(*e*) Earl of Godolphin.
(*f*) Francis Baſſet, Eſq; H. Mackworth Praed Eſq; Mr. Abel Angove.
(*g*) Francis Baſſet, Eſq;
(*h*) Francis Beauchamp, Eſq;
(*i*) Hugh Rogers, Eſq;
(*k*) Sir J. St. Aubyn, Baronet.
(*l*) J. Uſtick, Eſq;
* James Buller, Eſq; the late Robert Hoblyn, Eſq; Mr. Abel Angove.

preſent

preſent that of tin, it being computed [n] that, for fourteen years laſt paſt, the copper of this county has produced caſh, one year with the other, to the amount of one hundred and ſixty thouſand pounds. This is a happy addition made within theſe forty or fifty years to the employ and revenue of this county; and what the Corniſh gentlemen have now to conſider is, whether both may not eaſily be ſtill improved.

SECT. XIV. Matters worthy of farther conſideration relating to the copper-buſineſs in Cornwall, ſuggeſted to the Lords and Miners.

The water, in which they waſh their copper ore, has been lately experienced by an ingenious foreigner [o] to make as good blue vitriol as any in the world, which appears from the vitriol manufacture lately carried on at Reddruth; but there is ſtill another, and more profitable uſe to be made of the ſame. The water which comes from the bottom of the mine, is now ſuffered to run off in waſte through the adit, whereas it is ſo ſtrongly impregnated with copper, that if, together with the water in which they *griddle*, *jig*, *ſtamp*, and *buddle* the ore, it was collected carefully, and detained in proper receptacles and pits, old pieces of iron might be immerſed in theſe pits to great advantage, and thereby a quantity of malleable copper might be obtained without hazard or attendance, or other coſt than that of the moſt uſeleſs old iron. When the water is ſtrongly impregnated, the exchange is uſually quick, and performed in fourteen days; but if a much larger ſpace of time was required, the demurrage will be well requited. The experiment has been tried by W. Lemon, Eſq; of Truro, and with ſucceſs: I have alſo a ſpecimen of ore precipitated in the copper-mine of Trewan in St. Agnes, and there is ſcarce any copper-mine but will have the ſame effect; and the gain may be eſtimated in ſome meaſure by a calculation made at the copper-mines of Arklow in Ireland, where "one ton of iron-bars immerſed in the adit in twelve months time produces one ton and nineteen hundred and a half weight of copper-mud, or duſt; now, each ton weight of mud, when melted, produced ſixteen hundred weight of the pureſt copper, ſelling at ten pounds *per* ton more than the copper made of the ore [p]. In theſe mines the proprietors had at one time five hundred tons of iron, and might with proportionable advantage have laid in as many thouſands. The ſofteſt iron is beſt; the pits ten feet long, four wide, and eight deep; the ſides faced up with ſtone and lime, with wooden beams acroſs the pits to reſt the iron bars upon: chains of theſe pits are continued along the ſtream as far as the directors pleaſe, for the water never abates its quality [q]." It is not every ſtream which comes from

[n] Letter from William Lemon, Eſq; to the author, January 12, 1758.

[o] Mr. Rouby of Plymouth.

[p] Philoſophical Tranſactions for 1752, page 502.

[q] Ibid.

a copper

a copper lode that will produce ſuch a ſurprizing quantity of copper, and in Cornwall, where we have ſo much water uſually in the bottoms of our mines, the cupreous particles may in many places be too much diluted to yield the above-mentioned great return, but it is not to be queſtioned that the experiment will anſwer, under proper directions, in a great many adits, eſpecially where one drift or adit ſerves as a drain to many workings.

Another point worthy of conſideration is this; "that copper grows in the ſame places with gold and ſilver, and oftentimes, in following a vein of pure copper, they have met with a neſt of the fineſt gold; but it is more uſual to have its veins change into ſilver [r]. "The mine of Oſloquee, in the Lipes of Peru, was at the top in a manner all copper, and every ſpade's depth, as they dug downwards, the ore grew more rich in ſilver, untill in the bottom it became all pure ſilver [s]," and in a copper-mine called Huel-cock, in the pariſh of St. Juſt, native ſilver has been found among the copper ore, and it would be very wonderful if this mine ſhould be the only one which afforded an inſtance of this kind among ſuch a number of mines as we have, and ſome much richer than this.

That the glaſſy red has a great affinity to the ſilver ores has been mentioned before, and it is not improbable but ſome of our ores may contain gold as well as ſilver. Copper-mines have alſo quick-ſilver oftentimes in their lodes, and in Hungary it is thought ſtrange when the *Herenground* mines are ever without it. Now in Cornwallthe proprietors, generally ſpeaking, do not know the quality of the plaineſt copper, much leſs the nature of the richeſt: they take the word, as well as the money of the buyer implicitly; nor are they at liberty, by the preſent rules of commerce, to inſiſt upon any aſſay they have made of their own ores, or poſtpone the ſale to a better offer. This matter might poſſibly be put upon a more ſatisfactory as well as equitable footing, in caſe an aſſay-office was eſtabliſhed for every owner to have recourſe to, and aſcertain in ſome degree the value of his ore before he treats with the agents of the company; but better ſtill, and more likely would it be to bring the ore to a juſt value, if melting-houſes were erected for refining copper in the ſame manner as there are for tin. This would employ an additional number of hands, and every new employ is of ſervice to the county in proportion to the number employed: this would alſo leave the ſeller at liberty to frequent that melting-houſe which offered moſt kindly for his ore. It is objected, that the expence of importing coals from Wales for melting copper, will never permit ſuch a ſcheme to take place. Whether this be matter of fact or not, is at preſent

[r] Sir Hum. Mackworth of the mines, page 151.

[s] Alonſo Barba, page 83.

under

under examination, ſeveral gentlemen having concurred to ſet up furnaces for melting and refining copper-ore in Cornwall, and to the ſucceſs of the experiment, without entering into the diſpute, I refer it.

CHAP. XVIII.

Of Silver, Lead, and Quickſilver found in Cornwall.

SECT. I. Of ſilver.

IT is reported that Edward I. and Edward III. reaped conſiderable benefit from the ſilver found in theſe parts, ſince which ſeveral gentlemen have ſearched for the ſame metal at ſeveral times, but without ſucceſs [t]; and in the ſixteenth century, one Mr. Burchard Craneigh, a German, ſeems to have had the direction of ſome mines carried on to raiſe this valuable metal; he ſet up a refining-houſe alſo in the hundred of Weſt ſome little time before Mr. Carew's writing, though with ſmall advantage [u]. Silver found in Cornwall by itſelf, unmixed, (I mean, free from tin, copper or lead,) I have never ſeen but once, and that was found native, about the bigneſs of a walnut, (of which I have part,) in Huel-cock, a copper-work in the Pariſh of St. Juſt. It is indeed ſeldom that ſilver is found any where native [w]; 'tis generally ſo intermixed with ſtone, that it is not to be known but by men of experience [x]: 'tis uſually mixed alſo with other metals, tho' oftenеſt in a kind of black ſtony glebe, full of ſhining ſtreaks: it has a corroſive ſulphur or bitumen always attending it [y]. What may be mixed with the ore of copper has been hinted already in the foregoing page; and if any unknown ore fuſes and runs before it ignites, it is moſt probably ſilver, and merits farther enquiry [z].

SECT. II. Of lead.

Lead and tin were anciently [a] reckoned only two different ſtates of one and the ſame metal. Tin was called the *Plumbum album*, and eſteemed the pureſt; and what we call Lead, was the *Plumbum nigrum*: but if theſe were really but two ſorts of one metal, as not only the ancients but ſome moderns [b] have thought, then there would be different and intermediate ſtates of purity and weight, whereas we find lead always of the ſame determinate weight, lead being to water as 11345 to 1000, and tin always as 7321 to

[t] Carew, page 7.
[u] Ibid. page 130.
[w] Some ſurprizing inſtances however there are of this kind in the Norway ſilver-mines. In the Royal Muſæum at Copenhagen, there is preſerved a piece of native ſilver five hundred and ſixty pounds weight, another piece two hundred and ſeventy-nine pounds weight, another two hundred and forty-five, and a fourth three hundred and forty pounds weight. Pontop. part I. Engliſh, page 188.
[x] Alonſo Barba, page 77, 78.
[y] Boyle's Hydroſt. balance.
[z] Boyle ut ſupr.
[a] Plin. lib. XXXIV. chap. XVI.
[b] Clerk's Phyſ. page 136.

1000, or as 7--$\frac{321}{1000}$ to 1 [c]: Beſides, lead will diſſolve in acids, but tin, like gold, in *aqua regia* only. Lead therefore and tin are two metals radically diſtinct, each conſtant to its own peculiar ſpecific weight, and requiring a different *menſtruum* from the other. Lead is of great uſe, not only in ſheets, pipes, or more ſolid ſubſtances, but for refining other metals, for making paints, varniſhing pottery-ware, for yielding oils, tinctures, and ſome other aſſiſtances in phyſic; lead will alſo yield ſilver, and ſome lead a quantity very profitable to the owner.

SECT. III. Mines of lead in Cornwall.

Of this metal many mines have been anciently and lately worked in Cornwall [d], and in many places it is diſcovered among other metals but in too ſmall quantities to yield much profit. The mines at Penroſe, near Helſton, have been wrought above two hundred years, and have yielded tolerable profit within theſe thirty years; the ore is moſtly of that ſort called Potter's ore, but ſometimes yellow [e]. Dr. Woodward (vol. II. page 29) gives a very advantageous character of the ore found at Guarnek, in the pariſh of St. Allen, near Truro. "It was a blue lead ore, very rich in ſilver, perhaps beyond any in England beſides: this ore, when only dreſſed, ſells for eight pounds a ton, which is about the value of lead itſelf; one of the proprietors, and ſome of the workmen, averred, that a ton of this lead yields one hundred and forty ounces of ſilver: the vein of ore was about a foot over, but in ſome parts near three feet, and about fifteen fathom deep."

SECT. IV. Sorts of lead-ores.

Lead is for the moſt part of a greyiſh blue colour in the mine, not much unlike what it is in the metallic ſtate. Of this kind there are ſeveral ſorts; as, firſt, potter's or teſſellated ore, conſiſting of a ſhining, rectangled, tabulated ſtructure, and always breaking into granules of like parallelopiped ſhape; and, when lead is cheap, this ore, well cleanſed, is worth about ſix pounds a ton. This is found in Sithney, Camborn, and many other parts of Cornwall. Secondly, that which is of a flaky, ſmooth, and gloſſy texture, not breaking into cubical dies, but more ponderous, and therefore containing more lead. Thirdly, a very cloſe-grained ore, breaking into an uneven ſparkling ſurface like a grey tiſſue, very rich in ſilver. This is ſcarce in Cornwall [f].

[c] Boerh. by Shaw, page 59.

[d] In the pariſhes of St. Meran, Boconek, Piran-Sands, St. Agnes, Crowan, Sithney, Gwinear, St. Iſſy, St. Columb, Illogan, and Camborn. The works moſt noted formerly, are thoſe of Penroſe, Penwortey, Trevaſcus, Reliſtian, and Guarnek. See Woodward's Cat. vol. I. page 217, 218, and vol. II. page 30.

[e] Woodward's Cat. vol. II. page 28, line 22.

[f] Some of it was ſent me from the works at Beerferris in Devonſhire, and I have it alſo from Cardiganſhire in Wales. There is a mock-lead very ſhining, and like the true of this colour; the irregular ſhape and texture of its granules, and its want of weight, will diſcover it. By fire, it will divide into a powder, which may be ſtrewed upon writing.

Lead

Lead is ſometimes found ſo involved and hidden in ſpar, that, were it not for its eminent weight, no metal would be ſuſpected. Some of this ſpar is like a pumice-ſtone [g], ſome granulated, others of a fibrous ſtriated texture, like the ſplinters of a bone glewed together, and of a browniſh colour [h]; ſome of a tabulated cryſtal, making little or no efferveſcence with *aqua fortis*, of a whitiſh ochrous colour, tranſparent [i]; another ſort of white tranſparent ſpar in ſtraight-lined columnar *ſtriæ*, from Cardiganſhire in Wales, of which we have ſome alſo in England. Some ores of this metal are cavernous, in green cryſtals, which are ſcarce: at Miſnia, in Germany, it is found in beautiful colours, in Mendip hills Somerſetſhire, in Denbighſhire, and at Penrôs in Cornwall [k]. Of like ſort, but in a more ochrous feeder, I have ſeen lead-ore broke in the tenement of Nanſkêg, in Illogan pariſh, bedded in a yellow clay of the exact colour of ſulphur, without any other ſulphureous ſign but that of colour, very heavy, and reckoned rich in lead. This laſt ore is variegated in St. Iſſy works, Cornwall [l]. We have alſo in Cornwall a foliaceous talky kind of lead-ore, but what I have ſeen is light in compariſon, and of leſs beauty than the ſtriated talky lead-ore from Ireland, which is white, ſpeckled with purple, and exhibits very elegant ſpecimens. Lead is ſeldom, ſome think never found in a native, that is, in a metallic ſtate; but Dr. Woodward [m] has given us an account of one ſpecimen of this kind, and Linnæus has native lead found in Germany, which he calls *Plumbum nudum* (Syſt. Nat. page 184, N°. I.) Lead is alſo ſaid to be found compleat and malleable in a mine of the iſland Jamaica. It is however very ſcarce, and in general, if lead-ore will yield three parts in four of the metal, (*viz.* ſeventy-five out of one hundred) it is reckoned very rich, but if it yields only forty out of one hundred, it is not worth working, unleſs eaſy to come at. Lead-ore may be very rich in lead, and yet not afford one grain of ſilver; and, on the other hand, the ore which is poor in lead, does ſometimes yield ſilver plentifully. As to the potter's ore, the ſmaller the grains the more ſilver they are likely to contain, and *vice verſâ* [n]; but where-ever ſilver is found incorporated with lead, extracting the ſilver does by no means impoveriſh it; if the aſſay be ſkilfully performed, it leaves the lead in a better and more uſeful ſtate than it was before [o]; but lead is very apt to conſume and loſe of its weight every time it is melted; upon this, and many other accounts therefore, it requires a ſkilful hand to make the moſt of it.

[g] From Turky.
[h] From Tipperary, in Ireland.
[i] From Ireland.
[k] See Woodward's Cat. vol. II. page 28.
[l] Ibid. vol. I. page 217.
[m] Ibid. vol. II. page 28, l. 23.
[n] Grew's Muſ. R. S. page 329.
[o] Sir Hum. Mackworth, page 41.

Our

SECT. V. Lodes of lead.

Our lead-veins in Cornwall generally run eaſt and weſt, but are not large in dimenſions, nor ſo laſting as the veins of this metal in ſome parts of Wales, in Derbyſhire, and other parts of England, and ſeldom or never yield much lead, excepting when they are croſſed by other lodes, and then they make what the miners call a Bunch, or bank of ore, juſt in the place where the fiſſures interſect. Tho' this be the general courſe of lead-veins with us, yet the wideſt and richeſt lodes of this metal which we have in Cornwall, are obſerved, as I have been informed, to run north and ſouth. Lodes of lead in Britain, ſays Pliny [p], when exhauſted, after reſting awhile, are repleniſhed with the ſame ore. The matter of fact is much to be queſtioned; yet if there be ſuch ſucceſſive renovations, it cannot be from the air, as he imagines, but from the water, which circulates the contents of the adjacent *ſtrata*, and depoſites them in the retentive hollows and fiſſures of the mine. Lead does not throw itſelf into ſuch a variety of figures as tin; the only regular ſhape in which I have yet ſeen lead-ore in Cornwall, is that of the parallelopiped kind, called the Dice, or teſſellated ore: three of theſe in their natural ſize, are inſerted Plate xx. Fig^s. XXXIII, XXXIV, and XXXVII. (the largeſt grain of lead I have ſeen); and, for the ſatisfaction of the curious, two ſpecimens of the Tipperary lead are added, Fig^s. XXXV and XXXVI, ibid.

SECT. VI. Little wrought in Cornwall.

Though lead has been diſcovered in ſo many parts of this county, we have not any one mine of note, excepting only in St. Iſſy near Padſtow, in preſent working, upon account only of the lead; but as our grounds are ſo ſubject to this metal, and in ſome places the ore is ſo rich in ſilver [q], and yet ſo latent, diſguiſed, and, as appears from what has been ſaid before, of ſuch various aſſociations, that no two foſſils can be more unlike than ſome ſorts of lead ore; and as new diſguiſes, not here particularized, may occur to the curious, and particularly as the ore richeſt in ſilver has no more than the appearance of ſpar, and ſometimes common clay, the gentlemen of Cornwall have reaſon to be cautious that a great deal of this precious metal be not thrown away, as good for nothing, by the unſkilful miner, and that the ſeveral ſorts of lead-ore, as they are raiſed, be careſully examined, and ſeparately tried; and becauſe few miners know or can diſtinguiſh lead, or will be at the pains of procuring proper information for their maſters, when they meet with any thing new, it is much to be wiſhed that gentlemen, who have property and leiſure, would acquaint themſelves with the eaſy proceſs of aſſaying metals, or would ſubſcribe towards the maintaining a

[p] Lib. XXXIV, chap. XVII.

[q] See above of Guarnek.

general

general aſſay-maſter, who ſhould not only be obliged to aſſay, but come to the ſpot upon proper notice, and examine, at the ſide of the mine, any new or likely product which the ground ſhould afford. It might alſo be a part of his province to procure conſtant quarterly information of the price of metals and ores at all foreign markets. It has been mentioned before [r], that the true black lead, or molybdæna, is found in Cornwall; and if a vein of this lead, which is found no where in Europe to any purpoſe but in the county of Cumberland, ſhould offer, as is not unlikely, it is in ſome danger of being neglected or thrown away, becauſe it is neither tin, common lead, nor copper.

Quickſilver found in Cornwall I have not heard of, yet it is thought by ſome mineraliſts a ſtanding rule, that where copper abounds, there is always quickſilver [s]. Moſt likely it is ſo mixed and entangled with other bodies, that our miners, not ſeeing it liquid, never endeavour to diſcover it in the cinnabar or ore; neither do they at all heed that quickſilver is found ſometimes in hard ſtones of a ſaffron, and blackiſh colour [t]; in both caſes it is very eaſy for it to eſcape our labourers.

CHAP. XIX.

Of Gold found in Cornwall.

IT has been queſtioned whether there was ever any gold worth notice in Britain [u], and Cicero [w] ſays, that, according to his information, there was neither gold nor ſilver in Britain; but Strabo [x] and Tacitus [y], who muſt have had better information, confeſs both, and the latter intimates, that theſe precious metals were the Roman motives to conquer Britain [z]. Mr. Carew informs us, page 7, (and Camden from him) that ſome little quantities of gold were found in his time, but ſo inconſiderable that they were uſually ſold for a few half-pence. Mr. Scawen, who writ near the middle of the laſt century, ſays, that "gold has been made out of the Corniſh tin-works." Mr. Boyle [a] obſerves, that "he had by him ſome fine gold, which never endured the fire, taken out of tin-ore," moſt likely from Cornwall; for Sir Humphrey Mackworth [b], in his pre- SECT. I. Of gold anciently known.

[r] See page 130 of ſemimetals.
[s] See before of copper, page 208.
[t] Boerh. page 76.
[u] Muſgrave, vol. I. page 169.
[w] Ad Famil. tom I. lib. VII. epiſt. VII. edit. Elze. & Hack. 1676.
[x] Lib. IV.
[y] Vit. Agric. chap. XII.
[z] Fert Britannia aurum & argentum pretium victoriæ.
[a] Philoſ. Tranſ. N°. XIX. page 339, and general heads, page 39.
[b] Curioſities of England, page 24.

face, ſays, " the tinners of Cornwall do now frequently find little quantities of gold and ſilver among the tin-ore, and Queen Ann (1702) granted a patent to Mr. Robert Lydall of Truro, for ſeparating gold and ſilver from tin by precipitation in a reverberatory furnace by ſome peculiar fluxes."

SECT. II. Of late farther diſcovered.

Theſe diſcoveries have been lately advanced: in 1753, ſome perſons [c], of the pariſh of St. Stephen's Branel, ſtreaming for tin in the pariſh of Creed, near the borough of Granpont, and perceiving ſome grains of a yellow colour, very ſmall, but yet ſo heavy as to reſiſt the water, culled out ſome of the largeſt grains, and carried the tin to a melting-houſe near Truro. The gold was in ſuch plenty in this tin, that the melter, Mr. Walter Roſwarne, taking the gold at firſt for mundic or copper, " blamed them for bringing it for ſale without having firſt burnt it; but, upon aſſaying the ore, found it to make a very great produce, and exceedingly fine metal: the miners then took out of their pockets ſeveral pieces of pure gold, and one ſtone as large as a walnut, with a pure vein of gold in the middle of the ſtone, about the bigneſs of a gooſe quill; the clear bits of gold, and that in the ſtone, were then aſſayed, and produced juſt an ounce of pure gold [d]." The tinners became afterwards more attentive to what was mixed with their ſtream-tin, and at ſeveral times are ſuppoſed to have ſold ſomewhat conſiderable. This piece of good fortune not remaining any long time a ſecret, the tinners in the adjacent pariſhes of St. Stephen's Branel, St. Eue [e], and St. Meuan [f], followed their example, and have rather had better ſucceſs this way. At Luny, in the pariſh of St. Eue, James Gaved, a ſtreamer there, found native gold immerſed in the body of a blue ſandy ſlat: " He has alſo ſeen gold (as he ſays) *kerned* about ſpar," that is, fixed and concreted on the quartz [g]; but it is very rare to find it thus incorporated. Mr. Roſwarne above-mentioned ſuſpects, as he informs me, that there is gold, more or leſs, in all ſtream-tin in the county, having ſeen it in tin brought from St. Eue, Creed, St. Stephen's, St. Meuan, Probus, Kenwyn, and many other pariſhes. He has now by him one piece of pure gold, brought him by the forementioned perſons, which weighs to the value of twenty-ſeven ſhillings, another that weighs in value ſeventeen ſhillings: he has ſeen two or three bits from Probus which weighed about fifteen ſhillings, intermixed with *white ſpar* or quartz: I have one which weighs half a guinea; but the largeſt piece found in Cornwall, which has reached my notice, is that in the poſſeſſion of William Lemon, Eſq; of Carclew, which weighs in gold-coin three pounds three

[c] Charles and Samuel Trethewy.
[d] Letter from Mr. Roſwarne, February 11th, 1756.
[e] At Luny.
[f] At Trelowa.
[g] In Cornwall called Spar.

ſhillings,

ſhillings, or fifteen pennyweights and ſixteen grains, brought him in the latter end of September 1756. The dimenſions of this piece of gold may be ſeen Plate XXI. where Fig. XXV ſhews the thickneſs, and Fig. XXVI the ſide-view or width of this piece of pure gold; and from the compreſſed ſhape, Fig. XXV, it appears to have come from a vein half an inch wide at a medium. On each ſide it has a light-brown, fatty earth, which is the only impurity it is mixed with. It was found in the pariſh of Creed, near the borough of Granpont.

That gold lies ſometimes ſo intermixed with tin was not unknown to the ancients; Pliny (lib. XXXV. chap. XVI.) gives us a plain account of theſe metals being found together in the ſame manner as we find them now in Cornwall, the tin in *calculi*, (that is, ſmooth, pebbly ore) of the ſame gravity as the ore of gold *, and ſeparated by ſearſing. "*Separantur caniſtris*," ſays he, (not *caminis*, as in ſome editions) that is, by baſkets of the ſame nature and uſe as our ſearces. Beſides this detached gold, gold is alſo immured, if I may ſay ſo, in tin; the tin-cryſtals, Fig. XX, XXI, and XXII. Plate XX. have not only *flammulæ* or ſparks, but alſo ſtreaks of gold; gold has the ſame appearance ſometimes in foreign parts. "At Wunſiedel, in the margraviate of Baireuth in Germany, tin-grains of various colours, holding particles *(flammulæ)* of native gold, are not uncommon [h]."

SECT. III. Diſcoveries meriting farther attention.

This late diſcovery of gold in Cornwall is therefore neither without former precedents, nor at preſent of any great importance; it is in its infancy, though known one thouſand ſeven hundred years ſince; and, if purſued, will at leaſt gain my countrymen the credit of induſtry, if it ſhould not produce the profit which induſtry deſerves. Some circumſtances in this diſcovery, however, may well claim our farther attention. Firſt, This gold found in the pariſhes above-mentioned, is always intermixed with grains of tin-ore, which, by their roundneſs and ſmoothneſs, ſhew that they have been waſhed down from the neighbouring hills. Is it not likely then that the ſame hills contain gold as well as tin, each in their mineral ſtate? for native gold fixed in the ſtone, and veining it, as well as in ſeparate grains, is now found in Cornwall; and native metal is but the accidental defæcation of the ore by ſubterraneous *menſtrua*. In America gold is found in veins [i] as other metals are found here with us, and it is moſt likely that the gold-duſt found in Africa and Aſia, in the ſands of brooks and rivers, all comes from the veins in the hills adjacent, though not worked by the ignorant Moors and In-

* Tin purified is the lighteſt of metals, but in the ore the heavieſt.

[h] Letter from Mr. E. Dacoſta, F. R. S. June 26, 1755.

[i] Alonzo Barba of Oruro mines, page 75.

dians.

dians. Should not therefore all uncommon ores near theſe places be well examined, not only by waſhing, but by the more certain criterions of quickſilver, fire, and the hydroſtatic balance? Our ſtreamers know indeed native gold, but gold is not always apparent to the eye; ſometimes it is found in brooks, as in Larecaja in American Spain [k], in colour and ſhape like ſmall ſhot (the ore being ſmoothed and rounded by the agitation of water as our tin-grains); of theſe they melt away the outward coat, and then the granules are of a red colour: Sometimes gold is found in the clefts of rocks [l], of a grey colour on the outſide like unto lead: Sometimes the ore of gold well powdered muſt be tried and collected by quickſilver, or great loſs will enſue, and the gold be waſhed away. Again: Gold is often found mixed and incorporated with other metals; with copper often, with ſilver ſtill oftner, and ſometimes inſerted in tin cryſtals, but moſtly bedded in diverſe ſorts of ſtones [m], and ſometimes to the depth of one hundred and fifty fathoms.

It may be worth while therefore for people to acquaint themſelves with theſe different appearances of this moſt precious metal; and ſince we are convinced by theſe late diſcoveries, that we have more gold in Cornwall than was ever formerly imagined, it may reaſonably be ſuſpected, that in our Copper and tin, in the ſtate of ore, and for want of a proper commixture of quickſilver, a great deal more eſcapes us than we collect. Laſtly, in working the mines of thoſe hills in St. Stephen's, St. Meuan, and St. Eue, for which there is ſuch apparent encouragement, careful and intelligent perſons ſhould be appointed to ſuperintend the bottoms; beſides, the brooks and rivers, which run from thoſe hills, might probably pay well for ſearching.

SECT. IV. Mountains not neceſſary to the production of metals.

Before I finiſh this treatiſe of metals, I cannot but take notice that ſome learned men, obſerving moſt mines to be on riſing grounds, have thence concluded that mountains were neceſſary to the production of metals; and Mr. Ray (Creat. page 216) doubts whether there can be any generation (as he calls it) of metals and minerals in perfectly plain and level countries; with ſubmiſſion, there is very little reaſon for this doubt. A mountain, *quatenus* ſuch, has no more to do with generating minerals than a valley; it cannot be owing to its ſhooting up into the air that it becomes metallic; the unevenneſs of the outward ſurface of the earth can have no effect this way: if there be any generation, it muſt be owing to the concurring materials contained in the bowels of the mountain, materials as well ſpread in the loweſt valleys (though perhaps ſomewhat deeper immerſed) as in the higheſt hills, and as apt to unite and form a body of ore in the one as in the other: in ſhort, metals are

[k] Al. Barba, page 74. [l] In Coroico, ibid. [m] Ibid.

diſpoſed

diſpoſed in ſuch particular diſtricts as it pleaſed God (who divides his different bleſſings among the different parts of his world) to diſtribute them, and in ſuch parts of theſe diſtricts they are found as they were either originally lodged in, or have been transferred to, accumulated, and depoſited in by after-movements; and we find in Cornwall (where we have no hills which deſerve the name of Mountains) our lodes, in low as well as riſing grounds, ſtored with metals, without any regard to the height of the one, or depreſſion of the other: It is true, hills and mountains facilitate the diſcovery and raiſing of metals, but cannot increaſe them where they are, more than the loweſt valleys, (the inward ſtructure of the *ſtrata* being nearly alike) much leſs generate them where they are not. If there be any ſuperiority with reſpect to metals, it muſt in all reaſon be to the advantage of the lower grounds; for where-ever the waters percolate, they may tranſlate in ſome degree the metallic particles, and it muſt be from the higher to the lower, not from the lower to the higher parts of the *ſtrata*.

CHAP. XX.

Vegetables of the Land and Sea.

THE oak, aſh, and elm, and other foreſt trees in Cornwall, are moſtly ſituated round the dwellings of the inhabitants; in other counties, the willows in the vale, and the beech and other tall trees upon the hills, adorn the whole county: it is otherwiſe in Cornwall; but this deficiency is not owing to any incapacity of ſoil, or ſourneſs of climate, but to this; that huſbandry and planting, which ſeparates counties into fields and incloſures, came late into uſe here in Cornwall, and have not yet prevailed upon the planter, at leaſt in the weſternmoſt parts, to ſurround his meadows with poplar, willow, or alder, or edge his hills with elm, oak, and beech. There are ſome other reaſons why we have few large plantations in Cornwall. All the Duke of Cornwall's ancient parks * in which there was (according to the old manner) a great number of foreſt-trees, and much copſe, being diſparked by Henry VIII. upon a ſuppoſition that the ground would turn to better account in tillage, the wood was deſtroyed; but, by ſome miſmanagements, the royal intent was never anſwered. Another reaſon of the ſcarcity of woods is, that *blowing* of tin (that is, melting it with wood fire [a]), has much diminiſhed and conſumed our wood by charking; the manner of ſmelting tin-ore with pit-coal having not been practiſed

SECT. I.

State of planting in general in Cornwall. Foreſt trees.

* Nine, I think, in number.

[a] See page 182.

more than ſixty years. Another reaſon of the ſcarcity of wood in Cornwall is, that ſome of our ancient woods are now covered with the ſea [o], as particularly between Ramhead and Loo, and, in the weſt, betwixt Penzance and St. Michael's Mount, and very likely on ſome of our other ſtrands. However, ſome ſmall woods, or rather large plantations, we have in Cornwall, which are moſtly ſituated in the valleys adjacent to our four great rivers, *viz.* the Tamar, Fawy, Fal, and Alan; cultivation beginning, as is moſt likely, and gentlemen of fortune building their ſeats on the banks of rivers for delight and conveniency. In theſe ſituations therefore we have ſome old woods; at Godolphin there is a very ancient and extenſive plantation round the houſe, as there are alſo at ſome other ancient ſeats, and at preſent no gentleman builds without allotting a proportion of ground to his foreſt-trees and gardens; we have alſo ſeveral plantations lately raiſed and laid out in a more unconfined and rural manner than was formerly the cuſtom [p]; ſo that at preſent the taſte for planting is general, and oak, elm, and other foreſt trees, but above all the ſeveral kinds of firs and pine, are propagated with great ſucceſs. We muſt not expect indeed in our ſouthern climate, that the fir will be of any great utility; trees have their climates, and may live, but never come to perfection out of them; this tree in particular, though found foſſil in ſome parts of England [q], covets the more northern colds, which compreſs and ſtrengthen the fibres, and inſpiſſate the juices more than warmer climates can do; and the firs in Cornwall (ſome of fifty years ſtanding) I have obſerved ſhort-fibred, the timber not reſinous, ſmooth, nor well compacted, in no wiſe comparable to that of Norway. However, the fir-tree may be the winter garniſh of our gardens, and at leaſt compenſate the culture by its continual verdure.. Several trees, unknown here in the laſt generation, have alſo been introduced, and riſe to the credit of the owners, as well as to the ornament of their groves. Among the reſt, it ſhould not be forgotten, that the plane-tree, of which the ancients were ſo fond, which hiſtory has thought it worth while to record as planted at Delphi by Agamemnon's own hand, which Xerxes thought worthy of a golden wreath, and dedicated ſolemnly to a peculiar deity, a tree whoſe ſeveral ſtages Pliny [r] has traced from Syria through the Grecian Iſlands, till it arrived in Italy, and paſſed thence to the weſtern parts of Gaul [s]--Let it not be forgotten, that this tree, ſo deſervedly celebrated, and for its broad leaf and

[o] See the Ancient and Preſent State of Scilly Iſles, page 94, 95.

[p] At Anthony, Port Elliot, Trewithen, Tregothnan, Carclew, Nanſwhydn, Tehidy, Clowance, Trelowarren, Trevetho, Enys, Caſtlehornek, and others.

[q] In Lincolnſhire, Ray's Diſcourſes, page 233, and Staffordſhire, 237, ibid. and Lancaſhire, Dr. Leigh's Nat. Hiſt.

[r] Lib. XVI. chap XLIV.

[s] About the time that Rome was ſacked by the Gauls, lib. XII. chap. I. ibid.

wide-

To Sr John St Aubyn Bart this Western Cornwall, engravd at his expence,  view of Clowance in the parish of Crowan, is most gratefully inscribd by

Wm Borlase

wide-ſpreading ſhade exceeding all the trees of the wood, was introduced into theſe weſtern parts, about the year 1723, by the late worthy Sir John St. Aubyn of Clowance, Baronet. He found his paternal ſeat naked and fenceleſs, bereaved of its old plantation; he applied himſelf to reſtore, and left it in a fair condition to rival the moſt conſiderable planted grounds in the county.

Some accidental ſingularities happen to our foreſt-trees in Cornwall, as elſewhere. The aſh-tree has ſometimes its leaves variegated with white, but having kept one ſeveral years, I could never perceive that it made healthy vigorous ſhoots, but the contrary. The oak called Arundel's Oak, in Lanhadron park, in the pariſh of St. Eue, mentioned by Mr. Carew [t], bore its leaves ſpeckled with white, and, as the neighbourhood fancied, the leaves were never of one colour but immediately before the death of the Lord; but the moſt remarkable alteration in the colour of leaves that I have heard of, is that which is reported to have happened to "an oak near the manſion-houſe in the park of Boconek [u], in which King Charles I, when in Cornwall, ſet up his ſtandard: the leaves at this time were green, as in other oaks; but, ſoon after the King's murder, changed moſtly white, and continued ſo till about thirty years ſince." The truth is, that the leaves of trees become variegated by ſome infection communicated to their ſap; when they imbibe the poiſon, ſome obſtruction, feebleneſs, and decay of their veſſels enſues, and the juices are not ſo duely ſecreted and concocted as before.

SECT. II. Fruit-trees.

Fruit-trees have been at leaſt as much cultivated of late years in Cornwall, as thoſe of the foreſt. There is no gentleman now without his peaches and nectarines, as good as any; the apricots do not thrive with us in the weſternmoſt part; they bloſſom well, and bear tolerably, after they are come to maturity, for a year or two, but never after; they have been tried in different ſoils, under good direction, and all kinds of ſhelter, but to little purpoſe; perhaps our air is too ſharp and ſalt for them: * Cherries, pears, and the more uſeful apple, have been cultivated to great advantage within our remembrance, and a great deal of cyder made, which by proper choice of the fruit, and judicious racking the ſettled juice, has been greatly altered for the better, as well as increaſed in quantity, within theſe thirty years. In the latter end of Elizabeth, Mr. Carew (a gentleman very intent upon the improvement of this county) ſeems

[t] Page 140, and from him by Mr. Norden, page 57.

[u] Late Lord Mohun's, now belonging to Thomas Pitt, Eſq;

[w] "This account, ſays my author, (Mr. Cockran) in a letter, ſent me about thirty years ago, he had from Mr. Dennis, Mr. Aubyn, and Mr. Alexander, (who was a juſtice of the peace) all three gentlemen of eſtates, who have it from ancient people (whoſe families knew the oak before the King's death) and have themſelves viewed it." Dr. Brown-Willis to the author, April the 15th, 1756.

* The mulberry fruit does ripen well in the weſternmoſt parts of Cornwall, as I have obſerved for thirty years laſt paſt.

to

to wonder why more vines are not planted in Cornwall, ſo much nearer as we are to the ſouthern ſun than any other part of England; but being more ſoutherly in ſituation is not the only thing requiſite to vineyards; our Autumn, which is the time for gathering grapes, is generally wet; then, our ſummers are never hot, (it being hotter in the moſt northern inland counties of England than with us) conſequently they cannot ripen the juice to that flavour and ſpirit which making of good wines indiſpenſably requires: I much doubt therefore whether vineyards in Cornwall will ever anſwer. Hop-gardens have been much improved of late years, and in many parts of the county ſupply the inhabitants with a ſufficiency for their malt-liquors; but the major part of what is uſed, is imported from London.

SECT. III. Foſſil-trees.

From trees above ground, let us deſcend to the ſubterraneous vegetables called Foſſil-trees. In the year 1740, Chriſtopher Hawkins, Eſq; of Trewinard, draining a marſhy piece of ground on the banks of the river Heyl in Penwith, found ſeveral pieces of oak, buried four feet deep or more under the ſurface, in a faſt clay; one large ſtock of a tree about ten feet long, had no branches, its top part pointed to the downhill, the colour of it very black. The timber was hard and firm, and indeed timber never decays as long as the oil, one of the chief ingredients in the compoſition of plants, is kept in its proper place; perpetual moiſture effectually performs this; but let the warm air exhale this oil, and the ligneous parts ſhall imbibe and evaporate their moiſture, extending alternately, and then contracting and ſhrivelling the tubular veſſels: a ſeparation then (in which all deſtruction conſiſts) enſues, and the parts diſunite, which were before glewed together by an inimitable mixture of oil, earth, and water. Land-floods ſeem to have looſened and overthrown theſe trees, and the adventitious ſoil, waſhed down from the neighbouring hills and tin-works by the river Heyl, (which has contributed to choak the harbour below) gradually interred theſe trees deeper after they were fallen. In ſuch ſituations, that there ſhould be foſſil-trees is not to be wondered at, and I believe there are few ſuch without them; but we muſt look out for other cauſes, where the circumſtances of the ground, and the properties of the trees diſcovered, manifeſtly differ. In the year 1750, John Roberts, of the pariſh of Senan, digging for tin near Velindreath, found, at the depth of thirty feet, an entire ſkeleton, about the bigneſs of that of a large deer, but ſuch a ſet of bones as he had never before obſerved: The beaſt lay on its ſide, and near it, in a line parallel to its vertebræ, a proſtrate tree of twenty feet long, about the diameter of a moderate man's waſte; great numbers of leaves

were

were on the branches, ſome large, ſome ſmall, and the impreſſion of the leaves was plain in the earth. The tree was of the oak kind, and ſo ſoft in ſome parts, that the ſhovel ſtuck in it, but extreamly hard at the knots and ſpurs: not far from the ſkeleton, but unconnected, lay part of a deer's horn two feet and a half long, thicker than a man's arm-wriſt, with the branched antlers to it; one of the knobs was as big as a man's fiſt, but, as ſoon as this part of the horn was touched, it crumbled to duſt; one tooth which I have was taken from the ſkeleton, with ſeveral other pieces of deer's or elk's horn, found, in the ſame place, in the year 1753, twenty feet under the ſurface. The *ſtratum* in which they lay was the ſame ſhelly ſand as that of the ſea-ſtrand adjacent for nine feet, then a ſandy earth intermixed with ſmall ſtones, which the tinners call Cothan, (wherein the ſand-tin is uſually found) about a foot and a half above the karn. The queſtion here will naturally occur, how this tree and the ſkeleton became interred together. There is no ſign of a tree any where near this place, nor any record of ſuch creatures as the elk or mooſe-deer (to which theſe horns are moſt uſually aſcribed *) having been ever in this country; beſides, although the horns of ſuch creatures are ſometimes found, "the bones of them are a rarity;" yet, by their lying in a parallel line, they muſt have fallen together, and the ſame violence likely that overwhelmed the beaſt muſt have alſo proſtrated the tree. This muſt therefore either have happened at the univerſal deluge, when the ſame waters which had unfooted the tree, and drowned the creature, retiring, drew them both towards the ocean, or by ſome ſudden ſubſidence of the ſhelving part of the hill, when the land ſinking hurried away both the creature and the tree in one direction: to one of theſe cauſes the reader will probably aſcribe this unuſual phænomenon. The firſt may ſeem moſt likely, becauſe the tree and the creature are found depoſited at that depth where tin-ſtones, rounded and diſperſed by the flood, are uſually lodged; and yet, that there was anciently a ſudden ſubſidence of the ground in theſe parts, has been a conſtant tradition for ſome ages.

A third ſort of foſſil-trees is ſometimes diſcovered in lakes, bogs, and harbours, in whole groves together, and ſome trees among the reſt ſtanding as perpendicular as they grew. This is a phænomenon moſt likely owing to the ſubſidence of the ground, it being no unuſual accident (ſometimes perhaps by the undermining of the ſea, as Mr. Ray imagines [x], but oftener in earthquakes) for the ground to ſink, and a lake of water (where there was dry and planted land) to ſpring up and fill the cavity. On the ſtrand of Mount's

* Though I think it uncertain whether theſe horns belonged to the elk or the common ſtag of our own country, they having no broad plated fangs as the horns of the elk always have.

[x] Theological Diſcourſes, page 229.

Bay, midway betwixt the piers of St. Michael's Mount and Penzance, on the 10th of January 1757, the remains of the wood which, according to tradition, covered anciently a large tract of ground on the edge of Mount's Bay, appeared. The ſands had been drawn off from the ſhore by a violent ſea, and had left ſeveral places, twenty yards long and ten wide, waſhed bare, ſtrewed with ſtones like a broken cauſeway, and wrought into hollows ſomewhat below the reſt of the ſands: this gave me an opportunity of examining the following parts of the ancient trees: In the firſt pool, part of the trunk appeared, and the whole courſe of the roots, eighteen feet long and twelve wide, was diſplayed in a horizontal poſition; upon ſpading round, we found the ſand to be a thin layer only of ten inches deep, and then the natural earth appeared, in which the roots remained ſo firmly fixed, that, with a pick and crow of iron, we could not get off one piece, but were content to ſaw off what we could come at. The trunk at the fracture was ragged, and by the level range of the roots which lay round it, was part of the body of the tree juſt above its diviſion into roots. Of what kind it was, there did not enough remain above the roots poſitively to determine: the roots were pierced plentifully by the *teredo*, or auger-worm. Thirty feet to the weſt, we found the remains of another tree; the ramifications extended ten feet by ſix; there was no ſtock in the middle; it was therefore part of the under or bottom roots of the tree, pierced alſo by the *teredo*, and of the ſame texture as the firſt. Fifty feet to the north of the firſt tree, we found part of a large oak: it was the body of a tree three feet in diameter; its top reclined to the eaſt. In this much more ſolid wood, the *teredo* had made no lodgements; we traced the body of this tree, as it lay ſhelving, the length of ſeven feet, but to what farther depth the body reached we could not diſcern, becauſe of the immediate influx of water, as ſoon as we had made a pit for diſcovery. The earth reached within ſix inches of the ſurface of the ſands; but ſo firmly rooted was the tree, that no ſledge could move it: not ſo fixed was the ſtock of a willow-tree, with the bark on, one foot and a half diameter, within two paces of the oak, where, upon endeavouring to cleave off a part of the willow, the earth ſhook ſo much under the people at work, that they were in ſome doubt whether they had beſt to proceed: the timber of the willow was changed into a ruddy colour by lying ſo long in ſalt water. Hard by, we found part of a hazel-branch with its fat gloſſy bark on. The earth in all the tried places appears to be a black, cold, marſh earth, covered only with a thin layer of ſand, but very little intermixed. In it we found fragments of the leaves of the *Juncus aquaticus maximus*; and had any flowers appeared,

appeared, they would have pointed out the ſeaſon of the year when all theſe vegetables were interred, but I could find none.

The place where I found theſe trees was three hundred yards below full-ſea-mark; the water is twelve feet deep upon them when the tide is in. Theſe ſeveral phænomena will enable us to draw from them ſome intereſting obſervations.

Firſt, That the body of theſe trees muſt have ſtood at leaſt twelve feet higher than at preſent; conſequently there has been a ſubſidence on theſe ſhores, and the ground has ſunk more than twelve feet.

Secondly, Theſe foſſil-trees ſufficiently confirm the tradition of theſe parts, that, where the ſands are now ſtretching three miles in length, and a furlong (when the ſpring-tide has retired to its full extent) in breadth, from the town of Penzance to St. Michael's Mount, there was formerly a wood [y].

Thirdly, From the different levels of theſe vegetable remains, the body of the oak being many feet deeper than the undermoſt roots of the ſecond tree, it is plain that this ſubſidence could not have been equal in all its parts; the land ſunk in ſome places more, in ſome leſs (as is uſually the caſe in all ſubſidences, occaſioned either by earthquakes, or by the ſea's exhauſting the *ſtrata*, as Mr. Ray imagines, or by whatever other cauſe [z]), the ſubſidence being in proportion to the depth of the cavities underneath, as well as according to the ſolidity and texture of the ſhell above.

Fourthly, This ſubſidence of the earth had different tendencies in its ſeveral parts; the firſt tree ſeems to have preſerved its perpendicular ſituation, and to have leant only a little forward towards the ſouth, but the oak deſcends obliquely into the ſand with its top reclining to the eaſt; the motion therefore, which occaſioned the ſubſidence, was undulating.

Fifthly, The ground which ſunk, appears to have been a ſwarthy, marſhy plain of land, not much unlike the lower lands of Gulval and Ludgvan, pariſhes adjoining, covered thick with trees of the oak, hazel, and willow, at leaſt, if there was not a greater variety.

Sixthly, This ſubſidence having happened ſo many ages (probably near a thouſand years) ſince [a], without being followed by any ſucceeding convulſions or depreſſions of the earth ſince that time, (as far as we can learn) intimates to us, that where there are ſuch ſubſidences at the time of earthquakes, there is leſs danger of return, than where there are none; the caverns below, from which the momentum proceeded, being filled and choaked up by the falling in of the earth, and conſequently ſucceſſive earthquakes are not to be dreaded; but where there are no ſubſidences, or very ſmall

[y] Leland Itin. vol. III. page 7. Carew, page 3. Obſervations on the Scilly Iſles, page 92, &c.

[z] See page 158 and 159 before.

[a] See obſervations on the Scilly Iſles, page ibid. ut ſupra.

and

and partial ones, in proportion to the agitations of the earth, (as was the caſe of Liſbon in the late dreadful earthquake of November 1755) the caverns continue open as before, and the inflammable matter is at liberty to range, ferment, and expand itſelf, and conſequently produces new and frequent emotions of the earth, and that this is likely ſtill to be the caſe till the cavernous paſſages below are cloſed up by the ſubſidence of the grounds near the ſurface.

Laſtly, Theſe ſwampy pits of marſh earth retaining their moiſture, protected as they are from all exhalation by the ſea and ſands above them, are in the ſtate of quagmires; and when the ſands are diſperſed and thinned, (as will happen by the ſtorms and the *outhall* of the ſea) the quagmire is not ſufficiently covered: this is the reaſon that theſe and other ſands are occaſionally quick and ſinking, and give way to any incumbent preſſure; but the ſands in this place are never dangerous, as they are in other places, where the interred bogs are more lax and deeper [b].

SECT. III. Of ſhrubs.

From trees let us deſcend to ſhrubs. It is ſuggeſted that the ſweet-brier, or eglantine [c], does not grow naturally in Cornwall; but this is a great miſtake, as, from experience, I can aver, having plucked this perfumed plant out of the hedges in the neighbourhood of Mount's Bay, and tranſplanted them into my own garden, where they flower in as great perfection as any where, and may be eaſily multiplied by ſeeds, ſlips, or cuttings. The furze-buſh (or *ulex)* grows in great plenty, and affords cheap fuel to the poor. We have two ſorts of it, one a dwarf-furze of a ſmall prickle and branch, in the coarſeſt, ſhalloweſt ſoil, which we call Corniſh furze, never growing three feet high, flowering in autumn; the other five, ſix, and eight feet high, more woody, thriving beſt in a deeper and more tenacious ſoil, this makes a more laſting and fiercer fire; we call it French furze; it is the *geniſta ſpinoſa vulgaris* [d], and bloſſoms in the ſpring. Its leaves are of a deep green, and its yellow flowers ſo numerous and ſweet, that ſome gentlemen have raiſed hedges of it in their gardens, but the leaves are ſoon caſt, and the hedge grows bare and ſticky, ſo that experience, I think, does not favour the attempt. Among the Corniſh furze is great plenty of the common heath, (or *erica)* a plant which by its roots makes the turves cut up for fuel much the better, but its branches impede and weaken the furze. The Danes drew an intoxicating liquor from the *erica*, and ſome think they accounted it ſo precious as to erect lines of large ſtones for boundaries to limit the properties of this plant [e].

[b] See page 75.

[c] Roſa ſilveſtris foliis odoratis, Ray. Stirp. Brit. page 454. 3d ed.

[d] Ray, ibid. page 475.

[e] Hiſt. of Cork, vol II. page 358.

The

The great eſteem in which the ancient Corniſh held the Elder (or *ſambucus*) is very remarkable; the Cornu-britiſh words for it are *ſcau* and *ſcauan*, and hence we have many villages[f], and two ancient families[g] denominated. It may at firſt ſeem to be owing to the general ſcarcity of trees that even this humble ſhrub was thought conſiderable enough to give name to ſo many places; but if we conſider the great virtue of this plant in all its ſeveral parts and ſtages, we ſhall be convinced that few ſhrubs deſerve a greater regard. It is very hardy, enduring all weather, ſuiting all ſoils, eaſily propagated by ſeeds and cuttings: the medicinal uſe of its ſeveral parts is extraordinary; its leaves, buds, bloſſoms, berries, pith, wood, and bark, have more virtues than can poſſibly have room here without entering into too minute a detail; the following are moſt obvious, and moſt generally applied to for relief: The buds and leaves, as ſoon as they appear, are gathered to make baths, fomentations, and cataplaſms for wounds, and are a remedy for inflammations, &c. As ſoon as the flower-buds come on, they ſerve to make a pickle of very good flavour; the flowers at their opening, infuſed, communicate their taſte and ſmell to vinegar; infuſed, and let to ſtand in beſt Florence oil, excellent to be laid over bruiſes and external ſwellings, and, taken internally, very healing and cooling: the flowers, in their natural ſtate, are very ſudorific, and aſſwage pains; diſtilled with ſimple water make a ſweet, cooling waſh for the face in ſummer, which takes off inflammations of the eyes as a *collyrium*, is good for the wind in children, and a very innocent vehicle in fevers; diſtilled on ſpirits it aſſwages cholical pains in adult perſons; and there is a ſpirit to be drawn from the elder, which the late Duke of Somerſet (who married the heireſs of Piercy) took for the gout, as I have been informed, with ſucceſs. When the berries are ripe, they make a very wholeſome ſyrup in colds and fevers; and ſome make wines of them, by mixing rheniſh or other white wines[h]. Of the younger ſappy branches, the bark pared off cloſe to the wood makes a ſalve efficacious beyond moſt others for ſcalds; this inner bark is alſo very ſalutary in Dropſies, ſays Mr. Ray; the wood is cloſe-grained, ſweet, and cleanly, and beyond any other choſen by butchers for ſkewers, as leaſt affecting their fleſh: it is very beautiful alſo for turner's-ware and fineering, and, for toys, of as neat a poliſh as box, and the very pith of this uſeful ſhrub is proper to cool, and make ulcers and wounds digeſt. More uſes than theſe may occur by way of medicine,

[f] Boſcauan-rôs, and Boſcauan-ûn in St. Berian pariſh; two called by the name of Penſcauan in St. Enodor; Enyſcauan in St. Denis; Leſcauan in Sheviock; Fenton-ſcauan, name of a water in St. Ives; Treſcau formerly the moſt conſiderable village in the Scilly Iſles; Treſcau in Brêg, &c.

[g] That of the Right Honourable Lord Viſcount Falmouth, called Boſcawen, and the Scawens of Molinik in St. Germans, and of Carſhalton in Surrey.

[h] Ray de Sambuco paluſtri.

but the above are perhaps more than ſufficient to ſhew that the Cornu-britans did not denominate places and perſons from this ſeemingly contemptible ſhrub without great propriety: its peculiar properties are not to be wondered at, though numerous; they are indeed chiefly medicinal, and thoſe of other plants are ſometimes principally nutritious and domeſtic. Nature has differently diſtributed her bounties among plants, and placed them together ſometimes in great numbers. The palm-tree, as Strabo ſays, has 360 uſes, and the cocoa or coker-nut-tree yields wine, bread, milk, oil, ſugar, ſalt, vinegar, tinctures, tans, ſpices, thread, needles, linen-cloth, cups, diſhes, baſkets, mats, umbrella's, paper, brooms, ropes, ſails, and almoſt all that belong to the rigging of a ſhip [i], if we may believe Fr. Hernandez and other authors. Beſides this *Sambucus aquatilis ſeu paluſtris*, we have another ſort, which we call Scau-an-Cûz, or the Elder of the wood, ſome call it the Maiden Elder [k]. Its uſes have not been hitherto diſcovered to be as various and ſalutary as thoſe of the foregoing, but its wood is more flexile, and will divide lengthways as perfectly almoſt as whalebone, and is therefore much coveted by joyners. Greenhouſe ſhrubs may be preſerved in Cornwall with leſs care and attendance than in any part of England, and without any artificial heat. Myrtles even of the tendereſt kind, as the ſtriped ſmall leaved, the double flowering, and the reſt, (all which are greenhouſe plants in other parts of England) we keep out all winter, yet in the ſummer they flower plentifully †. Geraniums and jeſſamins ſtand out all the winter, unleſs when the cold is extream, and then they muſt be houſed till the ſeverity of the weather is over, when they may out again. In the month of January, 1737, tuberoſes in the dwelling-houſe at Ludgvan, jonquils and the ſmall pearl-aloe in the garden, were in high bloſſom; but the general mildneſs of the Corniſh air cannot be better evidenced than by the great American aloe *, which bloſſomed in the garden of Mr. George Keigwin of Mouſhole in Mount's Bay in the year 1757, and at the writing of this [l] ſtill ſurvives. This plant is common in hot climates, and, though it ſeldom bloſſoms, is well known to the learned in this; but as this is the firſt inſtance of its bloſſoming in England in the natural earth, I ſhall deſcribe and trace it. It was planted in the natural earth in the year 1724, and having ſtood thirty-three winters without the leaſt covering, on the 9th of June, 1757, the flower-ſtalk began to emerge from among the middlemoſt leaves. The ſtalk was round and taper, and beſet with ſmall marginal alternate leaves, above which was the inſertion of each branch, as

Greenhouſe ſhrubs.

[i] Ray's Hiſtory of Plants, lib. xxi. chap. vii. and Creation, page 208.

[k] Qu. an ſambucus humilis Raii.

† The Phlomis fruticoſa ſalviæ folio latiore et rotundiore, Tourn. (vulgo ſage of Jeruſaſem) ſtands altogether in natural ground, and yet in its ſeaſon is covered with flowers—the ſame may be ſaid of many others.

* Agave, Linnæi.

[l] February 1758.

Fig.

Fig. XL. *c*, *d*, Plate xx. page 186. It ſhot above five inches at a medium in twenty-four hours for the firſt month, but gradually leſs as it approached the ſummit. On the 21ſt day after its appearance the top of the ſtalk was fourteen feet from the ground, in which ſtage of growth I give it Plate xx. Fig. XXXVIII. On the 4th of Auguſt the principal parts were all formed, (as Fig. XXXIX. ibidem) the leaves ſix feet high; their ſpread eleven feet; circumference of the ſtalk at the top of the leaves fifteen inches; from the ground to the under branch ten feet: the branches were thirty-eight in number; they extended from the ſtalk at a medium two feet, each branch ſhooting from above one of the marginal leaves or appendixes; at the extremity of each branch was its bunch of flowers, which conſiſted of ſeven or eight *pedunculi*; on each peduncle there were from fourteen to forty-ſeven pods, very like the white lilly pods: the pods on one branch we had the curioſity to number, and they amounted in all to two hundred and nineteen; the bunch of flowers on each branch appeared September 16, as *a*, *b*, Fig. XL. ibid. The corolla, or ſyſtem of generative parts, C, C, Fig. XLI. ibid. is of the natural ſize; it was of a light-green colour; *a*, *b*, is the *capſula*, filled with clear water, ſweet as hony: the top of the *capſula* is divided into ſix petals in the ſhape of fingers, which graſp the piſtil *g*, riſing out of the center of the *capſula*, ſurrounded with ſix filaments *e*, *e*, and on the point of each filament one anthera, covered with the *farina*, as *f*, *f*, all of a bright Naples-yellow colour. September the ſixteenth the ſtalk, with the flowers on the top, was twenty-one feet ſix inches high, having grown only four inches in height from the fourth of Auguſt: the undermoſt branches were now nearly in full bloſſom, the upper ones more backward; the outmoſt leaves of the plant next the ground were a little flaccid and diſcoloured, a prelude to the approaching decay; for, as theſe ſconces (ſo ſome have called the flower-branches) ſucceſſively break forth into weighty bunches of rich yellow flowers; the aſcent of ſap is ſo copious, that the perſpiratory ducts, and the other neceſſary veſſels of vegetation, become too diſtended ever to recover their former tone; the root alſo (none of the moſt robuſt) by the continual duty of ſupplying ſuch quantities of moiſture for the flowers, is worn out, and the ſtately plant bloſſoms but once, (as if the production was too precious to be repeated) then languiſhes and dies; but its decay is ſlow and and commenſurate to the time it takes up in putting forth its flowers. On January 10, 1758, about fifteen of the under branches had dropped their ſeed-pods, the uppermoſt ſtill retaining theirs; the ſtalk not much ſhrunk, and the ſucculent leaves next the ground as freſh as three months before; ſome have lived twelve

months

months from their beginning to flower *. Of this plant the Icon was publiſhed by Camerarius in his *Hortus Medicus*, but the elevation defective, and the corolla leſs exactly, tab. v: ſtill worſe by Hernandez, page 270, chap. XII: by Bradley alſo (in his 2d Decad. page 1, of ſucculent plants) far from accurately, the *petala* of the *corolla*, being too large and ill ſhaped, the filaments and *antheræ* too ſhort and ſmall. I have given the ſeveral parts in proportion by ſcale annexed, and the corolla in its natural ſize, Pl. XX. Fig. XLI. This plant is of great uſe in America [m], ſerving the poor Indians for almoſt all the neceſſary purpoſes of life, but in theſe northern climates is cultivated rather for curioſity than advantage.

SECT. IV. Herbs, roots and flowers.

As to our garden and culinary plants (that we may now proceed from ſhrubs to their inferiour herbs and roots), they not only come for early uſe in the ſpring, but with little care ſubſiſt all the winter; and when pot-herbs of all kinds are deſtroyed by ſevere froſts in the more eaſtern counties, the tables of the gentry in Cornwall are plentifully ſupplied. Eſculent roots alſo enjoy the mildneſs of our winter, and remain untouched with canker or froſt till the ſucceedaneous plants of the ſpring make them leſs neceſſary. I find the northernmoſt Hundred of Stratton was remarkable, in the reign of Elizabeth, for its plenty of garlick; "the countryman's treacle, ſays Mr. Carew [n], which they vent not only in Cornwall, but in many other ſhires."

Every thing that belongs to the flower-garden, and grows in any part of England, will thrive and flouriſh here, as the late accompliſhed and courteous Philip Raſhleigh Eſq; of Menabilly did formerly manifeſt, and his preſent ſiſter, Mrs. Hawkins, (widow of the late Reverend Dr. Hawkins of Pennans) now at Pencoit, can ſatisfy the moſt curious. Our winters are uſually ſo favourable that they are a general encouragement, ſuch few roots miſcarrying thro' froſt, and ſpring flowers ſhooting ſo luxuriant. April 27, 1756, perceiving a number of flowers upon the ſtem of a polyanthos, I had the curioſity to pluck off the ſtalk, and found it to contain on it 353 flowers, ſo well does this plant deſerve the name of polyanthos, or the ſtem with many flowers [o].

SECT. V. Plants in particular; Hill and hedge-plants

Among herbaceous plants here, I will not pretend to give any non-deſcript; ſome, the moſt uſeful, and moſt pernicious which have reached my notice, their ſites and properties, with the rare plants of this county, publiſhed by Mr. Ray, or collected by Mr.

* This was blown down by a ſtorm February 11, 1758.

[m] "Planta hæc unica, quicquid vitæ eſſe poteſt neceſſarium præſtare facile poſſet ſi eſſet rebus humanis modus; innumeri penè ſunt uſus." Hernandez, ibid. ut ſupra.

[n] Page 118.

[o] Of grains, ſee in chap. VII. page 46.

Lhuyd,

To Thomas Hawkins Esqr. this South-east View of **TREWITHEN**, in the parish of Probus, Cornwall,
engrav'd at his expence, is most gratefully inscrib'd by Wm Borlase.

Lhuyd, will be ſufficient for my purpoſe; thoſe who are further curious, and would have this article treated of more ſcientifically, I muſt refer to ſome perſon who will ſingly apply himſelf to this extenſive ſcience, and track it not only through all the different ſituations of this county, (where poſſibly his pains may be rewarded by ſome not only rare but new plants) but through the now encreaſing volumes of herbals, as well as the mountains and vallies of foreign countries.

N°. I. Of the hill and hedge plants, I find a kind of mercury [p] with leaves like ſpinage: it is ſo effectual in the caſes of ſore or broken breaſts of women, that by a ſalve made of it, a Lady of the pariſh of Ludgvan cured in a ſhort time a breaſt [q] which had nineteen holes in it.

N°. II. Arſmart (in this Church-town) diſtilled has been found [r] to be better for gravelly complaints than a great variety of drugs taken with conſtancy, but to little purpoſe.

N°. III. The uſes of camomel are well known; it is common in Cornwall on every hill almoſt, as well as the banks of rivers, but more eſpecially in green ſpots, where the heath and furze which ſurround them have not as yet ſpread their roots: it thrives alſo in our gardens, whither it is tranſplanted becauſe of its ſmell, and ſtrengthening emetick tea: it is placed among the rare plants of Cornwall by Mr. Ray [s], and entituled *Chamæmelum odoratiſs. repens flore ſimplici, J. B.--nobile ſeu odoratius, C. B.---Romanum Ger.* We have it with the double flower as well as the ſingle, and equally ſcented.

N°. IV. "The fir-leafed heath with many flowers, *Erica foliis Corios multiflora, J. B.---Juniperifolia Narbonenſis denſe fruticans Lob.* on Gunhilly downs plentifully [t]." I have found it alſo near the Land's-End.

N°. V. *Erica flore albo*, gathered in Ludgvan pariſh.

N°. VI. "Blue, ſweet-ſmelling toad-flax, *Linaria odorata monſpeſſulana, J. B.* deſcribed in Camden, page 30, near Penryn, along the hedges plentifully [u]."

N°. VII. A remarkable ſtone-crop about four feet high, *ſedum majus arboreſcens vulgare* [w], found in an old cellar in Senan near the Land's-End. Much ſmaller ſtone-crop of this kind I have found growing in the ſhade, out of old damp walls, at Godolphin.

N°. VIII. Wood-ſage, *Salvia agreſtis ſeu ſcorodonia, Ger* [x]. at St. Michael's Mount, 1754.

[p] Mercurialis annua glabra vulgaris. Ray, ed. 2. page 54.
[q] Of Blanch French.
[r] By the late Reverend Mr. Peter, Rector of Mawnon.
[s] Third edit. page 185.
[t] Ibid. page 471.
[u] Ibid. page 282.
[w] Ibid. 2d. edit. page 151.
[x] Ibid. page 133.

N°. XI. Water-mint of a ſpicey ſmell, *Mentha arvenſis verticillata folio rotundiore odore aromatico* [y], a ſcarce plant gathered in St. Berian under a hedge, 1754.

N°. X. Roman nettle, *Urtica pilutifera ſemine magno lini, ſeu Urtica Romana* [z], gathered in a ſhady ditch at Velinvrân, Auguſt 4, 1754.

N°. XI. Sheep's ſorrel, *Lapathum acetoſum, repens, lanceolatum* [a], gathered on the north ſide of St. Michael's Mount 1754.

N°. XII. Hairy kidney wort, *Cotyledon hirſuta* [b], at Caſtle Treryn in the pariſh of St. Levin.

SECT. VI. Of vale, marſh, and aquatic plants.

N°. XIII. The firſt I ſhall mention of this ſort, is the *Ros ſolis*, *Droſera*, or *Rorella*, in Engliſh the Sun-dew, from a ſpeck of water which reſts in the middle of the leaf, even in the dryeſt day. In Cornwall we call this herb the *Iſles*; for what reaſon I know not. It is ſo very fatal to our ſheep, that they pine and die in every paſture where this plant abounds. Mr. Ray [c] was not ignorant of the hurtful effects of this herb: he obſerves, that it is of a fiery burning nature, and that the leaf, applied to the ſkin, raiſes an ulcer; that it is accounted hurtful to the ſheep, and by the farmers ſometimes called the Red-rot. This pernicious quality is not owing to the nature of the herb, but to an inſect or worm, which, feeding on this herb, lays its eggs on the leaf, and fixes them therein by ſome noxious poiſonous gum: the eggs are ſwallowed with the flowers and leaf, and eluding the *menſtrua* of the ſtomach, get into the chyle and blood; they are detained in the capillary veſſels of the liver, where, meeting with the requiſite degree of heat and moiſture they fecundate, the animalcules grow [d], and there make holes in which ſeveral of them lodge together, and feed upon the liver till it can no longer perform the functions of its ſtation, and the ſheep dies. Two of theſe inſects in natural ſize are given Pl. XXIV. Fig. X. *a* and *b*. The pregnant eggs of worms are taken in with food by children, and ſometimes adult perſons; and eſcaping the trituration of the ſtomach, lodge in ſuch parts and hatch, where the warmth and juices are favourable to the ripening, excluding, and perfecting the *fætus*. Many ſorts of fiſh alſo are ſubject to worms and animalcules: the mackrel has ſome frequently in its liver, ſo has the cod, eſpecially if it has a bad habit; and the hake is very ſubject to worms in moſt parts of the fleſh.

[y] Ray, 2d edit. page 123.
[z] Ibid. page 54.
[a] Ibid. page 56.
[b] Ibid. page 213.
[c] Ibid. page 227.
[d] Dr. Francis Nicholls M. R. F. R. S. ſays, that bullocks, as well as ſheep, "are ſubject to a ſmall flat worm, and often many of them reſembling a ſole, by the butchers termed flooks: this worm always builds a wall of ſtone for its defence, which is ramified like a Gall duct." Phil. Tranſ. XXXIX. for 1756, page 26.

The

The *Ros-ſolis* grows in ſhallow marſhy grounds: I have gathered it in Torvorian commons in Senan; it is frequently found on the Barton of Ludgvan-Lez: ſome moors alſo, belonging to the lands of the Church-town of Ludgvan, are ſubject to it; but where-ever it grows, the owner takes all poſſible care that the ſheep, who are fond of it, may not come near it.

N°. XIV. In the wet, ſpongy parts of our heathy grounds grows the black whortleberry, *Vitis idæa anguloſa* of J. B. and Mr. Ray [e], the angular-ſtalked Vaccinium of others [f]. In Cornwall we call the fruit, Whorts; they are the deſert of the common people, but the juice much inferior to that of the common black-berry.

N°. XV. Other rare plants of this ſituation are the ſmall, creeping, round-leaved, baſtard-chickweed, of which I ſhall give a more particular account. This plant is at preſent known by botaniſts to be found in Cornwall only, and Devon. chiefly in the former. Ray [g] calls it *Alſine ſpuria, puſilla, repens, foliis ſaxifragæ aureæ*; but it may be juſtly ſuppoſed, that he was doubtful where to claſs it; for he has not included it in his hiſtory of plants, nor in his ſupplement to it, which Plukenet in his Almageſt, page 23, wonders at; and therefore adds at length a particular deſcription of it from Mr. Ray's Catalogue, a prior work to both thoſe before-mentioned: he alſo gives an icon of it in Tab. VII. Fig. VI. Petiver (Herb. t. 6 f. 11.) calls it, *Chryſoſplenium Cornubienſe*; the Corniſh penny-wort.

Doctor Linnæus doubted a long while of the exiſtence of this plant, ſuſpecting that the Engliſh had multiplied the ſpecies by miſtake; Dr. Sibthorp, now Profeſſor of Botany in the Univerſity of Oxford, convinced him of its reality by ſending him a ſpecimen of the plant in the year 1750. Linnæus, out of reſpect to the donor, names it in his *Gen. Plantarum*, N°. 693, *Sibthorpia*; in his *Species Plantarum* deſcribes it thus, *Sibthorpia, foliis, reniformi-ſubpeltatis, crenatis* [h]; and in his letter to Dr. Sibthorp from Upſal, dated July 15, 1750, thus expreſſes himſelf: "*Pro Alſine Spuria tibi immenſas grates habeo, ... quia eandem pro planta ficta ex Hydrocotyle habuiſſem, niſi ipſe vidiſſem et palpitaſſem pulchrum ſpecimen quod in tui memoriam ſervabo.*" Of this doubtful plant I give an icon, Plate XXIX. Fig. XI. from a fair ſpecimen, (with ſeveral kind informations) moſt obligingly communicated by Dr. Sibthorp [i].

N°. XVI. Round-leaved, marſh St. Peter's-wort, *Aſcyrum ſupinum paluſtre villoſum* [k], found about ſpring-waters, moſtly near the Land's End.

[e] Second edit. page 457.
[f] Hill of Plants, page 403.
[g] Third edit. Synopſ. page 352.
[h] Gen. nov. 1099, page 21.
[i] This is called the European Sibthorpia, or Chryſoſplenium; of that which grows in Africa, and is ſomewhat different, Dr. Shaw has given an icon at the end of his travels among the African plants, page 39, N°. 139.
[k] Ray, ibid. page 344.

N°. XVII.

N°. XVII. Tender ivy-leaved bell-flower, *Campanula Cymbalariæ foliis, Ger*[l]. "on many moiſt and watry banks in this county."

N°. XVIII. The leaſt marſh-centaury, *Centaurium paluſtre luteum minimum*, found "on a rotten boggy ground between St. Ives and Penzance[m]."

N°. XIX. Butter-wort with a ſmall fleſh-coloured flower, *Pinguicula flore minore carneo*, "in moiſt meadows and marſhy grounds about Kilkhamton and elſewhere[n]."

N°. XX. Great yellow marſh-eyebright, *Euphraſia lutea latifolia paluſtris*, about boggy places, eſpecially towards the further end of this county[o].

N°. XXI. Verticillate knot-graſs with thyme-like leaves, *Polygonum ſerpyllifolium verticillatum*, in watry places between St. Columb and Michel, about Penzance, and towards the Land's End[p]. I found it at Caſtle-Treryn among the rocks.

N°. XXII. The leaſt calve's-ſnout or ſnapdragon, *Antirrhinum minus*, or *Linaria*[q], gathered in a bottom in Sancred, 1754.

SECT. VII. Rock and cliff plants.

N°. XXIII. Among the rock and cliff-plants the ſamphire, *Crithmum, ſeu Fœniculum marinum*[r], may be reckoned the moſt uſeful. In the iſlands of Scilly this plant grows luxuriant beyond what we have in Cornwall; ſome boil it as a pot-herb; pickled, it is thought to help digeſtion: Dr. Leigh, in his Lancaſhire, thinks it may be ranked in the firſt claſs of antiſcorbuticks: gathered in great plenty on the cliffs adjoining to the ſea in Piran-Uthno pariſh and St. Juſt.

N°. XXIV. Common fennel, *Fœniculum vulgare minus*[s], in the extreme parts of Cornwall near the ſea, betwixt Lannant and St. Ives, ſays Mr. Ray[t]. Of this uſeful plant, the ſeed quickens the eye-ſight, ſtrengthens the ſtomach and bowels, and relieves the aſthma: the leaves increaſe the nurſe's milk, are a good antenephritic, and the root removes obſtructions[u].

N°. XXV. In ſome little iſlands, or rather ſlightly covered rocks, (as Mullion gull-rock in Mount's Bay, Godrivy iſland in St. Ives Bay, *&c.*) one year nothing grows but mallows (the *Malva arborea marina*, as I take it, of Ray[w]); the next year nothing but beets*; the ſucceeding year mallows again, and the fourth year beets,

[l] Ray, 3d edit. page 277.
[m] Ibid. page 286.
[n] Ibid. page 281.
[o] Ibid. page 285.
[p] Ibid. page 147.
[q] Ibid. page 283.
[r] Ibid. page 217.
[s] Ibid.
[t] Ibid.
[u] Ibid.
[w] Ibid.
* Beta ſylveſtris, maritima, radice perenni.

and

and ſo on, the mallows and beets annually taking their turn to poſſeſs the iſland. This is a very ſingular viciſſitude, of which I have received frequent aſſertions from eye-witneſſes; and it may be attributed, as I imagine, to the following cauſe, *viz.* That when one of theſe plants (the mallow, for inſtance) ſhoots vigorouſly*, it maſters and keeps under the beet, till its leaves and ſtalks decay; the beet then, which lay the preceding year obſcured and weakened under the ſhade of the mallow, ſhoots away more early in the ſucceeding ſpring, and having the ſtart of the mallow, overtops and maſters it, till the beet decays, and then the mallow prevails in its turn. To make theſe plants ſhoot in full ſtrength, and maintain their yearly ſovereignty, the ſpray of the ſea, the *fæces* of the birds, (with which theſe rocks are perpetually diſcoloured) and their own putreſcent leaves and ſtalks may contribute; but as I have never viſited theſe rocks in perſon, I am not ſufficiently informed of the ſeveral circumſtances of theſe facts, and therefore ſhall not detain the reader, but refer them to further enquiry.

N°. XXVI. Marſh-aſparagus or ſperage, *Aſparagus paluſtris*, *Ger*[x]. found growing on the cliffs at the Lizherd point.

N°. XXVII. Smooth-leaved rupture-wort, *Herniaria glabra*, found at the Lizherd Point plentifully by Mr. Ray[y].

N°. XXVIII. Leſſer autumnal ſtar-hyacinth, *Hyacinthus autumnalis minor*, *Ger. Park.* found in plenty on the Lizherd Point[z].

N°. XXIX. Roſe-wort, *Telephium-roſeum*, *Mor*[a]. gathered alſo among the rocks at the Land's End, 1754.

SECT. VIII. Sand and beach plants.

N°. XXX. Our ſands on the ſea-ſhore afford ſome uſeful plants, of which the eryngo or ſea-holly may be reckoned firſt; it is the *Eryngium marinum* of Herbaliſts[b]: its root, for excellent ſyrup, and candying, is univerſally acknowledged to be a great reſtorative. It grows in greateſt plenty on the looſe dry ſands, above full ſea-mark, between Penzance and Marazion, and on the ſands near Gwythien bridge, where the ſea never reaches: it is alſo found in ſo many other parts of this county, that in this and ſamphire it is thought Cornwall exceeds any county in England[c]. Having tranſplanted eryngo from the beach into a light, ſandy, ſunny part of my garden, I found it to thrive very well.

N°. XXXI. Along the ſandy hills of the pariſhes bordering on the North-ſea, as Philac, Gwythien, and Piran-ſand, there grows a ruſh in the dryeſt and moſt naked ſand-heaps, which I take to be *Juncus acutus capitulis Sorghi*[d]. Theſe ruſhes have a two-fold uſe;

* This mallow has a woody ſtem, as great as a man's arm, flowers and roots large, ſays Parkinſon, ad malvam.

[x] Ray, 3d edit. page 267.
[y] Ibid. page 160.
[z] Ibid. page 373.
[a] Ibid. page 269.
[b] Ibid. page 222.
[c] Carew, page 19.
[d] Ray, 3d edit. page 471.

 their

their roots fix the ſands, and prevent them from ſhifting with the winds, and conſequently from making further encroachments upon the arable grounds; and the late Lord Arundel of Wardour, Lord of the ancient inheritances of the Arundels of Lanhern in this county, obliged his tenants of thoſe parts (as his anceſtors had done before) to plant a proper quantity of this *Juncus*, in order to preſerve their lands from being over-run; the other uſe is, that the leaves ſerve the induſtrious women of theſe pariſhes to weave a kind of coarſe mats for laying on floors, and mattreſſes for beds, market-baſkets, and church haſſocks, and very clean and wholeſome they are.

N°. XXXII. Small ſea-crane's-bill, *Geranium puſillum maritimum ſupinum Betonicæ folio*, found in ſandy places near the ſea, about Penzance and elſewhere [e].

N°. XXIII. Sea cud-weed, or cotton-weed, *Gnaphalium maritimum*, "on the gravelly ſhore between Penzance and St. Michael's Mount [f]."

N°. XXXIV. Creeping cock's-foot graſs, *Gramen dactyloides radice repente*, *Ger* [g]. "found by Mr. Newton on the ſandy ſhores between Penzance and Marazion plentifully [h]."

N°. XXXV. Sea-dogs graſs, long-rooted with a foliaceous ear, *Gramen caninum maritimum ſpica foliacea*, *C. B. (conoeidiâ, foliis bifidis, ſurſum tendentibus)* Ludgvan garden, 1756 [i].

N°. XXXVI. The Engliſh ſea-peaſe, *Piſum maritimum Anglicum* [k], on the beach near Penzance.

N°. XXXVII. Narrow-leaved wild flax, *Linum ſylveſtre anguſtifolium floribus dilutè purpuraſcentibus vel carneis*, *C. B.* "in the paſtures by the ſea-ſide, about St. Ives and Truro plentifully [l]."

N°. XXXVIII. Small purple ſea-ſpurge, *Peplis maritima folio obtuſo auctorum, ſive tithymalus*, found on the ſandy beach between Penzance and Marazion plentifully [m].

SECT. IX. Submarine plants, ramous.

Being now on the brink of the ſea, it would be an unpardonable neglect to omit the plants which our ſea contains, emulating almoſt the number, if not the variety of thoſe which live in the air, exceeding them oftentimes in fineneſs of texture, and beauties of colouring. Submarine plants are diſtinguiſhed by the learned, into ſtony, horny or ligneous, and herbaceous. Among the herbaceous ſea-plants, the moſt common kind is the *Alga*, *Fucus*, Graſs-wracks, Sea-wracks, aliàs Ore-weed: Of this there is a great

[e] Ray, 3d edit. page 356.
[f] Ibid. page 180.
[g] Ibid. page 399.
[h] Ibid.
[i] Ibid. page 391.
[k] Ibid. page 319.
[l] Ibid. page 362.
[m] Ibid. page 313.

variety

variety on our ſea-coaſts, of which the moſt curious that have reached my knowledge, for ſhape and colour, are,

N°. XXXIX. *Fucoides purpureum eleganter plumoſum* [n].

N°. XL. *Fucoides rubens variè diſſectum* [o]. Of both which plants the capillary ramifications are wonderfully diſtinct, orderly, and of a moſt beautiful *lake*-colour, even to the very extremities, when this *fucus* is in ſeaſon; but when they are either immature, or on the decay, their extreme ſhoots are pale ſtraw-coloured.

N°. XLI. *Fucus foliis Ericæ ſive Tamariſci, vel Erica marina* [p], Tamariſk-Wrack, found in Cornwall by Mr. Moyle and Mr. Stephens.

N°. XLII. *Conferva marina, geniculata, ramoſiſſima, lubrica, brevibus & palmatim congeſtis ramulis* [q].

N°. XLIII. *Fucus dichotomus parvus coſtatus & membranaceus* [r]. Membranaceous.

N°. XLIV. *Fucus membranaceus purpureus variè ramoſus* [s].

N°. XLV. *Fucus membranaceus purpureus latifolius pinnatus* [t].

N°. XLVI. *Fucus membranaceus rubens anguſtifolius marginibus ligulis armatis* [u], a plant of great beauty as to colour, but in ſhape exceeding all I have yet ſeen.

N°. XLVII. *Fucus membranaceus Ceranoides*; the Scotch call it Dils; the Iriſh, who chew it, Duleſh; found by the ſame [w].

N°. XLVIII. The largeſt and nobleſt plant of this membranaceous kind is the bloody ſea-dock, *Lapathum marinum ſanguineum*, or *Alga folio membranaceo purpureo Lapathi ſanguinei figura & magnitudine* [x]. When it is ſomewhat faded, the leaf is red variegated with ſtraw-colour, not unlike that of a ſtriped tulip; when it is in full ſeaſon, of a rich perfect blood-colour, and ſo ſmooth and thin withall, that, when well diſplayed on paper, feeling can hardly diſtinguiſh it from the natural ſurface of the paper; and it ſticks ſo tenaciouſly, that the paper may be folded or rolled, nay even plaited into the mount of a fan (as has been experienced by ſome curious ladies of this county) without any danger of the plant's ſtarting. Theſe membranaceous plants in general, though they retain their high colourings for years, (which ſhews how finely their colours are prepared and diſtributed) are indeed ſo extreamly thin, that a gentleman of my acquaintance, with no great impropriety, called N°. XLII. (*viz. Fuc. membran. purpur.*) the ſenſitive *Fucus*; "for if brought near the fire juſt to warm, and not heat it too much, its edges warp up, and in this ſtate, if a finger is moved towards them, they ſhrink from it, and recover their ſituation again when

[n] Ray, 3d edit. page 38.
[o] Ibid. d. N°. I. page 37.
[p] Ibid. N°. X. page 49.
[q] Ibid. N°. XXIV. page 61.
[r] Ibid. N°. XX. page 44.
[s] Ibid. N°. XXX. page 47.
[t] Ibid. N°. XXXIV. page ibid.
[u] Ibid. N°. XXXIII. page 47.
[w] Ibid. page 46.
[x] Ibid. page 47.

the

the finger is removed; placed on a hand tolerably warm, it keeps in perpetual motion to and from the hand like an animal ſtruggling for life [y]." Now this is at firſt ſomewhat ſurprizing, but is indeed entirely owing to the ſtructure of theſe bodies, the plants being ſo very thin that they yield to the perſpiration of the hand, the effluvia being of force ſufficient to repel the leaves when they are near [z].

Latifolious ſea-wrack.

N°. XLIX. *Fucus ſive Alga marina latifolia vulgatiſſima, vel Quercus maritima veſiculos habens*, the moſt common broad-leaved ſea-wrack [a].

N°. L. *Fucus ſive Alga latifolia major dentata*, broad-leaved indented ſea-wrack [b].

N°. LI. *Fucus folio ſingulari longiſſimo lato in medio rugoſo*, the ſea-belt [c].

N°. LII. *Lichen marinus*, the laver, ſlauk, and by the Iriſh called Slukane [d]. We have it with the green leaf, called Oyſter-green; but the brown or auborn-coloured, is that which is prepared by being boiled to a jelly and ſtewed, then left to ſettle, and is eat as very nouriſhing in Wales and elſewhere: this is alſo found with us in plenty; but never yet, as far as I can learn, manufactured as in Wales. I have been informed, that the juice of laver pounded, taken three ſpoonfuls in the morning faſting for three weeks together, has been of great ſervice in cancerous diſorders; and that the cure of a cancer in the breaſt (with what foundation I cannot ſay) has been attributed ſolely to it [e].

Anguſtifolious ſea-wrack and teretifolious.

N°. LIII. *Fucus anguſtifolius foliis dentatis*, narrow-leaved ſea-wrack with indented leaves, found here by Mr. Ray [f].

N°. LIV. *Fucus Kali geniculato ſimilis, non tamen geniculatus*, ſmall-wrack, reſembling glaſs-wort, found near the town of St. Ives [g].

N°. LV. *Fucus anguſtifolius veſiculis longis ſiliquarum æmulis*, narrow-leaved wrack with long pod-like bladders [i], near the Mount and Penzance.

N°. LVI. *Fucus folio tenuiſſime diviſo ſiliquatus*, codded ſea-wrack with finely cut leaves, found by Mr. Moyle of Bake in Cornwall, and Mr. Stephens, 1694 [k].

N°. LVII. *Fucus teretifolius ſpongioſus parvus*, ſmall, round-leaved, ſpongy ſea-wrack [l].

[y] Letter from the Reverend Mr. Griffith, F. of Pembroke College, Oxford, 1755.

[z] Iſinglaſs, when ſpread very thin, will yield in like manner to the force of perſpiration, ibid.

[a] Ray, 2d edit. page 2.
[b] Ibid. page 3.
[c] Ibid. page 6.
[d] Ibid. page 10.

[e] This relation came from a young lady who knew the perſon cured, and had the account of the cure from her own mouth.

[f] Hiſt. page 71; edit. 2d Synopſ. page 3.
[g] Ray, 2d edit. page 4.
[h] Ibid. page 5.
[i] Ibid.
[k] Ibid. page 5.
[*] Ibid. page 4.

the

N°. LVIII. *Fucus longo anguſto craſſoque folio*, ſea-thongs [l]. At the root or claſpers of this plant there is a concave capſulous part, the uſe of which has not hitherto been explained. Mr. Ray [m] calls it *Rotula latiuſcula caulem prope radicem velut axem ambiens*. Happening to land on the Geer (a rock half a mile ſouth of Penzance pier, covered with the tide eight hours in twelve) in ſearch of Corallines with Dr. J. Albert Schloſſer, F. R. S. a very curious and learned foreigner, in the year 1755, it was our fortune to ſee this *fucus* in its ſeveral ſtages of growth, but not one without this circular cavity. In ſome of them the ſea-thongs were in their moſt infant ſtate, the *gemmæ* or firſt buds appearing no other than *papillæ*, in the center of the cup-like cavity, which in this ſtate was very concave; in others the thongs were from an inch, two, three, and four, to four feet long, the *capſulæ* becoming leſs concave in proportion to the ſize and age of the plant; by which different ſtages of growth, it appears, that this cup is the upper part, or firſt ſheath of this plant, deſigned by nature to ſhelter and protect, by its cup-like cavity, the firſt tender buds of the *fucus*, till the ſtrings within this ſheath have gained a little ſtrength and footing, ſufficient to wade further into the ſea, and by its flexibility able to elude the violence of the water: I will only obſerve farther, that though the ſea-thong begins with a little bud no bigger than that of a *line* in diameter, yet it extends itſelf oftentimes to a great length: On the ſhore of Mount's Bay, in the month of July 1757, I meaſured ſome, and found them above twenty feet in length; they have alſo been meaſured in Falmouth Harbour, and found twenty-one feet in length. On the ſame ſhores with this *Alga*, are often- Sponges.
times found ſponges, uſually affixed to the rocks, ſhells, or ſands; ſome of which are leafy, having their parts ſhooting into the ſhapes of curled leaves (as are thoſe found on the ſhore near Loo); ſome are branchy, as the *Spongia ramoſa*; ſome are ſolid oblong balls, which incloſe a fiſhy embryo, *Spongia denſiſſima ſpiſſa valida cinerea* [n]; ſome full of large round holes at the top of its tubercles, of a purpliſh colour when taken out of the water, but ſoon fading to that of common ſponge; this ſort has a cavity alſo underneath, as if ſome living creatures had neſtled there, and uſed theſe holes as paſſages into the central cavity *; moſt likely it is a kind of crab which lodges its *fætus* in theſe ſpongy receptacles for their ſecurity, as Rondeletius intimates [o].

Many other ſorts there are doubtleſs of the *Alga*, and many other ſubmarines on the ſea-ſhores of Cornwall; but it is now time to obſerve, that of theſe herbaceous ſea-plants there are ſeveral uſes. In

[l] Ray, 2d edit. page 5.
[m] Ibidem.
[n] Rondelet, page 134.

* Some think the whole ſponge to be the work of inſects, but however that be, the animals above-mentioned are adventitious.
[o] Ibid.

iſlands of Scilly the ſheep and black cattle feed upon ſea-wrack, eſpecially when the other paſtures fail; and this they do, eating the plant in its ſalteſt ſtate from the rock whereon it grows, when the ebbing tide has but juſt left it. That horſes too will feed on it, with a little precaution, Plutarch[p] relates, *viz.* when Cæſar followed Cato into Africa, his ſoldiers, for want of forage, were forced to give the *Alga* on the ſea-ſhore to their horſes, having firſt waſhed off the brackiſhneſs by freſh water, and mixed it with a little herb called Dog's-tooth. In the iſlands of Scilly, of the *Alga* they make kelp, a kind of imperfect vitrification of the ſalt, oil, and earth of this plant burnt together: they ſend it to Briſtol to the glaſs-manufacturers; and in a fair dry ſummer, this article has been worth five hundred pounds to the Iſlands: but the moſt general uſe is for manuring the land; and there being ſo much ſea-ſhore on the edges of Cornwall, this plant offers itſelf ſo conveniently, and in ſo many places after hard winds, that ſcarce any induſtrious farmer can want dreſſing for his land[q].

SECT. X. Ligneous ſubmarines.

From the herbaceous, let us deſcend to the ligneous or horny ſubmarines, of which our ſhores (not having been ſufficiently examined) are thought to be deſtitute; but the warted ſea-fan, Plate XXIV. Fig. 1. is a ſufficient inſtance that ſuch plants are natives of the Corniſh ſhores, and are not to be raſhly pronounced of foreign growth. It grew upon Pednankarn rock, two miles ſouth-eaſt of Mouſhole pier in Mount's-Bay, in twenty-ſix fathom of water, whence it was plucked off by Andrew Harvey of Newlyn, fiſherman, by his fiſhing-hook, in the year 1750: it meaſures fourteen inches wide by twelve high, and, as I am informed, has been found much larger in the ſame bay. It is the warted ſea-fan of Mr. Ellis Hiſt. of Corallines, Plate XXVII, N°. 1. the *Keratophyton flabelliforme cortice verrucoſo obductum*[r].

The *flabellum veneris* has been found on the ſhores of Mount's Bay after a ſtorm, but whether from a wrecked veſſel, or torn off by the violence of the waves from ſome rock in the Bay, is not to be aſſerted poſitively; that we have plants of the ſame ligneous ſubſtance, and the ſame coralloid covering which incruſts all its branches, cannot be doubted.

SECT. XI. Stony ſubmarines. Corallines.

The ſtony ſubmarines are either corallines, (ſometimes called Coralline moſſes) coralloids, or corals. There is a great variety of corallines on the Corniſh ſhore, moſt of which, at preſent known, the ingenious Mr. Ellis before-mentioned, F. R. S. has taken care

[p] In Cæſare.
[*] Obſervations on Scilly Iſlands.
[q] See before of manures, page 86.
[r] Ray, 3d edit. page 32.

to

PLXXIV

pa. 239.

I

II

III

a

IV

b

Corals & Coralloids nat: size.

Inches 2 4 6 8 10 12

Scale to the above Warted Sea fan.

V

VIII

millepora retepora Eschara marina.

VI

VII

IX

Porus cervinus.

Eschara foliacea.

Pyramid at Arnvinek. p. 99

2 4 6 8 10 12 ft.

a

X

b

X

XI

Cornish Chough.

XII

Woodcock from the egg nat. size.

Scale of Inches for the Birds.

1 2 3 4 5 6 7 8 9 10 11 12

XIII

XIV

XVI

XV

XVII

A Monstrous Calf. 2 ft. 2 inches long.

to deſcribe moſt minutely. Theſe coralline moſſes are found affixed ſometimes to *fucus*'s and ſhell-fiſh, but in their moſt uſual ſituation to rocks, as a more firm ſettlement; here we find them ſometimes in ſcattered taſſels, at other times cloathing the rock on every ſide, and forming a piece of fringe-work equal in variety and ſtrength of colours to the moſt beautiful carpet. The chief deſign of nature in overſpreading the rocks and pools with ſuch a number of Corallines, I need not obſerve was to be as well a ſhelter to the leſſer fry, as nouriſhment to the larger fiſh (as we ſhall find in treating of ſea-inſects); but whilſt nature is principally intent upon and purſuing the uſeful, it never forgets ſhape, rangement, and colouring: its works are never barely uſeful; they are at the ſame time ornamental, neatly finiſhed beyond conception or the natural reach of the eye, engaging, various, exact, coloured, abundant.

Of the more ſtony, ſolid, white corals, I have obſerved three different ſorts. Firſt, when it fixes upon ſtones, and involves them with incruſtations, as Fig. II. Plate XXIV; this coral oftentimes reſembles the foliaceous turns of the liver-wort, as Plate ibid. Fig. III. and is therefore called Lichenoides. In the ſecond ſtate, it conſiſts of ſmall knotty branches, connected or growing out of one another like a ſhrub, and may therefore be termed the ſprig or branchy coral, as Fig. IV. *a*, *b*. Sometimes again it is found in globular lumps, in the middle more ſolid and compact than either of the former, the ſhort ſprigs which coat the outſide diverging from the centre, and ending at the circumference in ſolid, fungoid, protuberances, as Plate ibid. Fig. V. Beſides theſe ordinary appearances of white coral, we ſometimes find it in much more uncommon ſhapes, as the *Eſchara retiformis* [s], by Mr. Ellis [t] called the *Eſcara foliacea millepora lapidea*, *&c.* It was found on the ſea-ſhore betwixt Penzance and Newlyn, in the year 1755; the ſpecimen here exhibited, Plate ibid. Fig. VI. is but ſix inches wide; I have been aſſured by a very intelligent fiſherman, that he has drawn up one with his hook as big as an ordinary horſe's head: they are ſoft and tender when firſt taken out of the ſea, but ſoon harden and grow brittle in the air.

Coralloids and corals.

Corals have been alſo found on the ſame ſtrand of the aſtroite kind, pierced with holes of the aſteriſk ſhape from bottom to top; the inſect which either ſcooped out this coral to provide itſelf an habitation, or formed it as its ſhell, ſeems to have begun its workings at the baſe, from whence the principal or mother-worm roſe almoſt perpendicular; theſe artificers made ſeveral offsets as they roſe, which all diverge from the middle cavity, bending towards the ſides of the

[s] Ray, Syn. page 31, edit. 3.

[t] Page 71. Hiſt. of Corallines.

coral

corals: theſe maſſes are ſomewhat gritty on the exterior, but within almoſt as compact as ivory. Of the ſame kind are ſome with larger tubes, found, as well as I can recollect, on the ſea-ſhore near Penrôs in Sithney, in the ſame bay. I cannot help adding here the *Porus cervinus Imperati*[u], commonly reckoned an Italian coral, but found in our ſeas. This rare coral, Plate XXIV. Fig. VII. was taken up by a fiſherman at the Pole-bank, which lies two leagues ſouth-weſt of Gilſtone, Scilly; at the ſame place was found the thin cup-like *Eſchara*, Fig. x. which is the *millepora Retepora Eſchara marina* of Ellis, Plate xxx. *d*, page 53.

Coral in general.

All theſe, as well as the corallines before-mentioned, and the foſſil corals alſo (ſuch as the brain-ſtone and the like, of which Cornwall yields none that have reached my notice) are radically compoſed of the ſame ſubſtance; all ſhells alſo (as well of land-animals of the teſtaceous kind, as of fiſhes), the eggs of birds, and even the pearl itſelf are but finer pieces of workmanſhip of the ſame materials, raiſing the ſame efferveſcence with *aqua fortis*, but of different colours, different degrees of purity and conſiſtence, and different ſhapes. It may not be amiſs therefore to trace this ſubmarine general compoſt, as far as it is found in ſea-productions, through ſome of its moſt obvious metamorphoſes. Coral is a calcareous ſubſtance, ſparry (more or leſs) and argillaceous, partly extracted by the ſea from the *ſtrata* which it waſhes, and partly owing to the putrefaction and diſſolution of the parts of dead animals, chiefly of the teſtaceous kind. In its moſt minute ſtate, it nouriſhes ſea-plants and animals; it furniſhes a glue and earth to the teſtaceous fiſhes, enabling them to form their own ſhells: as it floats in the waves in a leſs diluted and pulpy ſtate, it is ſometimes born up by tempeſts, and diſperſed over the face of the ground, either by its ſalt and limy particles, warming and fertilizing both corn and paſture[w], or fixing and concreting the ſand of the ſea-ſhore into ſtone[x]. When larger aſſociations are formed, they are precipitated by their own weight, and the impulſe of the ſea-water: what ſubſides thus, if it meets nothing in its deſcent, reſts as a ſediment in the more ſheltered parts of the bottom of the ſea; if it fixes in its way down, it ſerves as a baſis for other *nubeculæ* of the ſame ſort to form themſelves upon, arreſting the little bead-like calcareous ſubſtances which come within its ſphere. Hence ſome of the incruſtations on ſtones and ſea-wracks; for it is plain that coral, when unimpregnated with active ſalt, ſeed, or egg, muſt fix like earth in a humble proſtrate poſition, as an incruſtation only, Fig. II. Plate XXIV; if agitated by the waves, then it folds itſelf into a *Lichen*-like foliage, as Fig. III. ibidem; if, whilſt it ſwims

[u] Ellis, page 72. [w] See page 84. [x] Page before, 95.

at

at large it meets any ligneous plants, it ſticks and coats them round as we find by the ſea-fans; but if this ſhell is not the plain conſequence of the adhæſion only of theſe particles, but the work of animals, and is accumulated round them by millions of ſea-inſects, which fix their ſhells ſo cloſe to one another as to form a compleat caſe to the branched ſubſtance which they incloſe, it is much more to be admired; if it picks up any ſeeds, we can eaſily imagine that by its fertilizing nature, it may feed, expand, and nouriſh theſe ſeeds into moſſes and corallines; if it meets with the *ovaria* of inſects, it ſerves as a nidus for them to grow in, and a ſhell afterwards (which may poſſibly be formed by themſelves) where they alternately hide themſelves for ſafety, and whence they extend themſelves for nouriſhment. Of the ſprig-coral, (if it be not the fabrick of animals, as ſome learned men contend) its branch-like ſhape, though ſo knotty and ſhort ſtemmed, may be owing to vegetation (as from its figure is uſually ſuſpected); but if, according to others, it grows only by *juxta-poſition*, theſe ſhort ſtems are rolled into a cylindrical form by the ſea, brought into contact before their ſoft jelly parts are hardened, then knotted together, and their interſtices filled more or leſs in proportion to the quantity of coral with which they chanced to coincide. I ſhall not not liſt in this diſpute, but in juſtice to the gentlemen who think corals the fabrick of animals, I muſt obſerve, that the eſcharæ, Plate XXIV. Fig. VI. and VIII. tho' curled and folded in ſuch a leaf-like manner, are no more (as it ſeems to me) than thin, and very orderly aſſemblages of the ſhells of animalcules: the faſciated coral [r] at its firſt beginning is no more than ſo many tubular ſheaths or ſhells of inſects; they are connected gradually by other inſects which ſtretch their coatings in tranſverſe lines from tube to tube, gradually filling up the ſpaces between, as in Plate XXVII. Figure VII; and in time this bundle of ſheaths is formed into a ſolid coralloid aſtroite, where the firſt and largeſt tubes ſtill appear, with their openings aſteriſked as in *madrepora poris ſtellatis* of Linnæus (Syſt. Nat. Tab. VI. Figure VIII). The *Tubipora* (Fig. VII. ibid.) conſiſts of ſmaller tubes placed cloſer together and connected, formed cylindrically by a ſmaller and different animal. The *Millepora* (Fig. IX. ib.) is pierced with holes, and ſcarce viſible to the naked eye; the tubes probably of more diminutive inſects; and our ſprig and branch-coral may poſſibly be the fabrick of ſtill ſmaller creatures, though to the eye no more than imperfect, uninformed vegetables. I would obſerve farther, that the teſtaceous animalcule which proceeds out of the *balanus* ſhell, (Linnæ. ib. Fig. IV.) has ſixteen legs or claws jointed

Whether corals the fabrick of animals.

[r] Lhuyd's Lithoph. N°. 104.

or articulated in the ſame pliant manner as the branches of moſſy corallines are; this might make one conclude, that as nature in ſome vegetable inſtances approaches nearly to animals, ſo in many of her lower animals ſhe approaches nearly to the ſhape of vegetables; the ſpace between both kingdoms is narrow, the tranſition eaſy, and ſcarce perceptible; and it ſeems not to be unlikely, that ſome inſects ſhould conſort, and conſtruct their nidus's in the plant-like form, becauſe it is indeed more ſuitable, upon many occaſions of food and ſecurity, to the exigencies of the medium they live in. This is no more unlikely, than that the ſpider ſhould ſpin her web to tranſmit, bend, yield to, and float in the air, and bees conform their combs to the holes and hives allotted them. Inſtinct is a fertile monitor, and can ſuit her leſſons to the occaſion of her diſciples. But to return: The coral ſubſtance is moſt perfect for poliſh and beauty, when moſt ſtony and cloſe-grained; but the coral of the Corniſh ſea-coaſt, in its fineſt ſtate, is of a coarſe grit compared to the oriental; as to poliſh and hardneſs greatly inferior; yet, as a manure for land, I ſhould think much preferable, being by experience found excellent in its kind for this purpoſe. Some of our coral is white as new-quenched lime, ſome cinereous, other brown yellow, according to the materials of which they are compoſed; for in the brown yellow more eſpecially, the ſpecks of clay and ſtone which give it that colour, may in the microſcope be plainly ſeen.

CHAP XXI.

Of Birds.

FROM vegetable, inanimate, and doubtful productions, let us riſe now to ſenſitive life: Of birds found in Cornwall, ſome are perennial, others migratory. Among the firſt may be reckoned the hawks, of which we have ſeveral ſorts; the marlions, ſparhawks, hobbies, and in ſome places the lannards [z]: In the reign of Elizabeth, the Corniſh and Devonſhire gentlemen employed a great deal of their time in hatching, nurturing, and inſtructing them to fly at the partridge [a]: In Cornwall at preſent this tedious ſcience, which conſumes ſo much of life for ſo little an end, is now no more, but ſtill exiſts it ſeems in a neighbouring iſland; for being at Trerice (the ſeat of the preſent Lord Arundell of Trerice) Auguſt 25, 1738, I ſaw a hawk which, being overpowered by a crow, fell near a man at his labour in the field, who, perceiving the

[z] Carew, page 25. [a] Ibid.

hawk

hawk quite ſpent, brought it into the houſe to a gentleman then ſteward to his Lordſhip. The hawk was armed as uſual with ſilver plates on its legs and neck, and Mr. Church (ſo the ſteward was called) perceiving an inſcription engraved, quickly diſcovered the name of an Iriſh gentleman, and the place he lived at; upon this he took great care of the hawk, and wrote immediately to the gentleman: The bird was a favourite, and the gentleman ſent a ſervant from Ireland into Cornwall on purpoſe to fetch it.

Among our Corniſh birds, the coracias of Willughby, or the pyrrhocorax, deſerves principal notice. It is found but rarely and at times in other countries, but conſtantly in this county, and therefore deſervedly among the moderns it has obtained the name of the Corniſh Chough. Pliny (lib. x. chap. XLVIII.) thought it peculiar to the Alpes, but Aldrovandus (lib. XII. chap. VIII.) informs us, that it is only ſeen there among the Rhæti in the winter: It is found alſo in the iſland of Crete, in the Cyclades, on the ſea-coaſts of Cork in Ireland, in Wales, and elſewhere: there is a pyrrhocorax in Africa called the Crow of the Deſart, but bigger than our raven, and therefore called the larger Coracias [b]. To the faithful deſcription of this bird in Ray's Willughby, page 126, nothing need be added; as to its defects and merits, ſomething, and not improperly, may. It is taken much with glitter, very agile and meddling, and therefore not to be truſted alone where fire, money, or papers of conſequence lye; but in both theſe particulars, as I have often experienced, not near ſo miſchievous as the jack-daw, (the monedula of authors) whoſe faults by miſtake have been too often imputed to our chough; a great enemy to houſes covered with thatch, the moiſt and rotten parts of which, by its long bill in ſearching for worms it diſperſes, and quickens the decay; it will alſo pick out the lime-pointing of walls in ſearch of ſpiders and flies. Theſe tricks have procured this bird a bad character; Camden calls it *incendiaria avis*, and Mr. Carew, page 36, the ſlander of our country; but certain it is that our anceſtors thought of it (and very deſervedly too) in a different manner.

Corniſh Chough.

Upton, who writ *de re militari*, about the middle of the fifteenth century, obſerves to the praiſe of the Corniſh, that ſome of their moſt ancient families bore theſe birds in their coat-armour [c]. Now, to ſhew that theſe gentlemen made no contemptible choice of their *bearing*, it muſt be remembered, that the Corniſh chough is the moſt graceful, ſlender, and genteel of the crow kind, for which

[b] Shaw's Trav. page 251.

[c] Sic ergo in laudem gentis & patriæ Cornubienſis (quæ gens rectè a Trojanis traxit originem & ab imitatione ut creditur, adhuc perſeverat) quidem antiquiſſimi nobiles ipſius patriæ iſtas aves in armis ſuis portant, quæ quidem aves [graculi ſcilicet quæ in roſtris et tibiis rubeſcunt] ſpecialiter in illâ patria ſunt repertæ. Edit. Byſſ. p. 195.

reaſon

reaſon I give it, Plate XXIV. Fig. XI. in another and more extended attitude than Mr. Ray's Willughby in his nineteenth Plate; its legs, toes, and bill of a ſtrong vermillion, and the bony ſubſtances of theſe parts clear even to tranſparency: they are always yellow when the bird is young, and in the hen yellower than in the cock, which different colouring probably made Aldrovandus by miſtake (as in Willughby is obſerved) think thoſe with yellow feet, legs, and bill, to be a different *ſpecies* from the coracias with red feet: its feathers are of a much richer velvet black than thoſe of any other crow. It is ſaid, that, having its tongue ſlit when young, it will thereby be enabled to imitate the human voice, a property which Bellonius alſo aſcribes to this bird [d]: this is certain, that as it ſhrieks aloud at the approach of any thing ſtrange, frightful, and unuſual, its chatter is extremely ſoft and engaging, when it applies for meat, and makes its court to thoſe who uſually feed and fondle it: its ſtrength lies in its bill and neck, rather than wings; it is not therefore ſo warlike in the air as other crows, but on the ground it is very pugnacious, whetting and darting its bill, and though as tame as may be, not admitting any ſtranger to touch him. Very apprehenſive of danger, it builds its neſt in the cliffs, but neither in the top, as if all danger was from below, nor near the bottom, as if all its fears were from above, but in the middle of the moſt ſteep precipice; very amuſing when kept tame; docile, regular, and conſtant to its hour for meat; early at rooſt; in bad weather fond of ſhelter and ſeldom ſeen; but preſaging good weather, it enjoys the air on the tops of houſes, if tame, if wild, ſtrutting ſtately along the hills or greens by the ſea-ſide.

Wild-birds. Of ſinging-birds, we have thruſhes, the black-bird, throſtle or ſong-thruſh, and the much larger and better coloured miſſel-bird or ſhrite, (the *Turdus viſcivôrus major* of Willughby, page 187) which we call in Cornwall the holm-thruſh; the Corniſh call the Holly-tree, Holm, and this the holm or hom-thruſh, becauſe, as I imagine, in the winter it feeds upon holly-berries, each bird taking poſſeſſion of his tree, keeping conſtant to it, as long as there is fruit, and driving away all other birds. (See Ray's Willughby, page 187). Our linnets are either green or brown; we have gold-finches, ruddocks, nopes or bull-finches, and larks. Nightingales I have not ſeen, or heard of any in Cornwall.

Of wild-birds, driven here by the extremity of the weather, we have all ſorts.

------ Ad terram gurgite ab alto
Quam multæ glomerantur aves ubi frigidus annus
Trans pontum fugat et terris immittit apricis [e].

[d] Aldrovandus Ornith. lib. XII. chap. VIII.

[e] Virg. Æn. lib. VI. ver. 310.

Ducks

Ducks of all kinds, the true wild-duck breeding in the marſh betwixt Penzance and Marazion; widgeon, teal, woodcock, ſnipe, &c. The ſhell-drake *(Tadorna Bellonii)* is rare, but in the hard winter 1739, I had one brought me exactly anſwering the deſcription of Ray's Willughby, page 363, Tab. LXXI.

Of the common periodical or migratory birds, "the ſwallows in the winter are found in the weſtern parts of Cornwall, ſitting in old deep tin-works and holes of the ſea-cliffs," ſays Mr. Carew, page 26. This is a circumſtance queſtioned by ſome Naturaliſts, and as confidently aſſerted by others; the truth is, when the winter comes on, and the air is no longer replete with the flies and inſects which are the ſwallow's proper food, this bird diſappears; ſome perhaps may paſs into other climates, or die, and others remain in a torpid ſtate in private caves, ſome under water, and ſome above. The red-wing or wind-thruſh, in Cornwall called the winnard, and fieldfare, are moſt common when there is moſt cold, in gentle winters few or none. The Royſton crow, with the black bill, head and wings black with a gloſſy blue, the breaſt, belly, back, and neck cinereous grey, ſhafts of the feathers blackiſh, continues with us from October to March, but generally on the ſea-ſhore, and betwixt Penzance and Marazion, fond of the products of the beach, though uſually reckoned granivorous. Migratory.

Woodcocks are reckoned birds of paſſage, but they do not always leave the country to which they occaſionally reſort: Some gentlemen, hunting in the neighbourhood of Penzance, in the ſummer-time 1755, fluſhed a woodcock; ſurpriſed at ſeeing ſuch a winter bird at that ſeaſon of the year, they haſtened to the buſh, and there found a neſt with two eggs in it: a gentleman, more curious than the reſt, carried the eggs home; and one being accidentally broke, the body of a young woodcock appeared, and encouraged him to put the other egg under a pigeon, and in a few days a living bird was diſcovered in it with its feathers on, in ſhape and ſize as in Plate XXIV. Fig. XII. page 239. Snipes alſo, young and from the neſt, are often fluſhed on Bodman downs.

As it is my deſign in this hiſtory to repreſent whatever is rare and worthy notice, as well as what has not been thoroughly deſcribed by others, I ſhall not omit an uncommon bird catched at Mouſhole, and brought to me Sept. 23, 1755; the great noiſe it kept in the night, the ſmallneſs of its bill, the diſproportioned largeneſs of the mouth, and the unuſual ſhortneſs of the legs, made me take the following meaſurements: From the point of the bill to the extremity of the tail, ten inches; from the tips of the wings extended, one foot nine; its bill flattiſh, thin, and only three tenths of an inch long, ſomewhat curved; the ſpread of its mouth very large, being two Rare birds.

inches and a half from the tip of the upper to that of the under mandible diſtended; the mouth ruddy-coloured within, and its depth a full inch and a half; from the point of the bill to the hinder part of the head, one inch and a half; the eye was black, and large in proportion to the bill; the neck to the pinion of the wing, one inch and a half; from the pinion to the tip of the wing, ſeven inches; the tail five inches long, conſiſting of ten feathers equal in length; four toes, the middle one ſeven eighths of an inch long, legs only five eighths; foot not webbed; its colour was betwixt that of a ſparrow-hawk and a woodcock, but the ground of the whole ſomewhat more inclining to a black: the weight of this bird was two ounces and a half, four penny-weights and two grains. It is very quiet and torpid by day, but noiſy and clamorous by night. Our common people call it the Night-crow; I take it to be the fern-owl of Shropſhire, called the churn-owl in Yorkſhire from the noiſe it makes when it flies, the goat-ſucker, the caprimulgus of Ray, Syn. page 2 and 26. Ray's Willughby, page 107. I have given a drawing of this bird Pl. XXIV. Fig. XIII. where, every part being done by meaſurement, it may give ſome parts more exact (or more particular at leaſt) than that in the fore-mentioned author, Tab. XIV. It is found moſtly in woods and mountainous places, in the Peak of Derby, in Yorkſhire, and Shropſhire, and ſome other places, but rarely in Cornwall.

The ſheld-apple or croſs-bill, as Mr. Ray calls it, (Synopſ. page 86) or ſhell-apple, as Dr. Plot, (Staffordſhire, page 234) is ſeldom ſeen in Cornwall; but in Mr. Carew's time, a flock of them coming about the time of harveſt, made great deſtruction among the apples, Car. page 26. In the autumn they ſometimes, though rarely, come into England, but never continue the whole year, or breed in our iſland.

The upupa, hoope, or hoopoe, Plate XXIV. Fig. XIV. was killed in the pariſh of St. Juſt, Penwith, in Cornwall: In ſome particulars it differed from Mr. Ray's Willughby; there was no red in its neck, all of a light cheſnut; the eight firſt feathers of the wing, as to the ground, quite black; five were croſſed or barred, the other three ſpotted near the ſummit with white; the remaining feathers croſſed with five white bars; the upper covering feathers of the wing not ſo black, but inclining to the cheſnut; the reſt as in Mr. Ray's Willughby, page 145. It was near the bigneſs of a ſnipe: it is rarely ſeen in Cornwall.

The green wood-pecker, or *picus Martius*, is a beautiful bird, remarkable for its vermilion crown on the head, and the different ſhades of green in its body and wings, which riſe from a deep mixture of brown through four intermediate tints, till it ends in a fine light

light-pink yellow. The ſtructure of the muſcles by which this bird is enabled to dart forth its tongue upon inſects, (its proper food) and recover it again into its ſheath, is admirable, and may be read at large in Ray's Willughby, page 136: the legs are very ſhort but ſtrong, and the toes ſtand two forwards and two backwards, enabling them (ſuitably to their determined courſe of life) to climb trees, and fix their footing firmly on boughs, to which alſo the ſtiffneſs of their tail-feathers not a little conduce. Ray's Creat. page 143. The preſent ſpecimen, Plate XXIV. Fig. XV. was killed at Godolphin, October 11, 1757.

The golden-crowned wren, *Regulus criſtatus Aldrovandi*, wood-titmouſe of Geſner, (Ray's Willughby, page 243. Ray's Synopſ. av. page 79) the leaſt bird I have yet ſeen in Cornwall, remarkable for its beautiful ſaffron-coloured and ſcarlet creſt, and ſmallneſs of its body - - - By the ſcale of the reſt, Plate XXIV. Fig. XVI.

The Pittrel (Cateſby, Append. page and plate 14) or little Peteril of Edwards (page and plate 90) is ſometimes met with here, as may be ſeen Plate XXIX. Fig. x. in the explication of which it will be further taken notice of.

Of water and ſea-fowls, that we ſhould have a great variety in Cornwall is no wonder, conſidering the great extent of our ſhores. Here we have coots, ſanderlings, (which, from the noiſe they make when flying, we call Towillees [f]), ſea-larks, ſea-pies; of puffins great abundance in their ſeaſon, and extremely fat, but of ſo fiſhy a taſte, that ſome have ſalted them to eat as fiſh [g]; all ſorts of gulls, mews, tarrocks, gannets, murres, heron, bittern, lapwing, curliew, bernacle, ſhagg (in the north called the Crane, ſays Mr. Ray, Syn. page 123); we have alſo the didapper, to whoſe inſtantaneous plunge into the ſea after its prey, Virgil ſo well compares the deſcent of Mercury from Heaven to Carthage.

Hìc primùm paribus nitens Cyllenius alis
Conſtitit, hinc toto præceps ſe corpore ad undas
Miſit avi ſimilis quæ circùm littora, circùm
Piſcoſos ſcopulos humilis volat æquora juxta. Æn. IV. ver. 253.

Of miſcoloured birds, I have known a white thruſh, (the *Merula vulgaris*, Ray's Willughby, page 190) kept for ſome time. It was living in the year 1724, in the poſſeſſion of John Bennett, blackſmith, of Ludgvan; a white ruddock, or robin-red-breaſt, in the poſſeſſion of the late Reverend Mr. Collins, vicar of St. Erth, in 1754; but I ſhall be more particular in noting the deviations of a white woodcock's feathers: It was brought to me January 1, 1739; at the inſertion of the bill it had a ſmall cinereous tuft of feathers

[f] Not Curwillet, as in Mr. Ray's Syn. page 109, 2d edit.

[g] Car. page 36.

half

half an inch high, as much broad, and ſloping down on each ſide to the bottom of the upper mandible; from thence, the head, neck, wings, and all the other parts, were of the fineſt ſnow white, ſaving three ſmall ſpecks on the crown of the head, of like colour to the feathers of other woodcocks, in the ſame place: In the breaſt and neck it had nine ſeparate feathers tinged ſo faintly as ſcarcely to be diſtinguiſhed from white, but of the natural wavy mark: in each wing it had one principal feather, and four ſecond-rate of the natural colour; in the right wing ſix ſpecks on the ſmalleſt feathers, in the left wing too; in the upper part of its tail two natural feathers, in the under, one, but in both of very faint colouring; the belly, and under parts of the wings near the *ſcapula*, tinged with a few faint natural feathers; the legs a little redder, and more of a fleſh-colour than in the common bird. This deſcription is of no other uſe than to ſhew that this bird was originally coloured as other woodcocks, and that ſuch departures from nature proceed from ſome accidental defects, extravaſation, or obſtruction of the juices, occaſioned by either exceſſive exerciſe, wound, or unwholeſome diet; but by which it is impoſſible to determine.

The eggs of ſea as well as land-fowls are variouſly ſhaped and ſpotted, making a pretty collection; and a little attention will ſhew that not only the eggs of the different *ſpecies*, but that the eggs of individuals of the ſame *ſpecies* are really different in ſhape, ſize, and colour, inſomuch, that the eggs of particular hens may be diſtinguiſhed from each other, and known (without regard to the neſts) from what hen they did proceed. Eggs owe the unnatural defects and exceſſes to which they are ſubject (ſuch as a yolk perfectly white, an egg with two whites, preternatural membranes and excreſcencies adhering to the egg, and the like anomalies) to a variety of accidents tedious to number, and difficult to aſcertain.

CHAP. XXII.

Of Land and Water-Inſects in Cornwall.

SECT. I. TO trace inſects through their reſpective differences, their tranſparent ſtructure, rich colourings, peculiar inſtincts and transformations, would much exceed the limits of the preſent deſign. Mr. Ray thinks that there are more ſorts of inſects than of birds, and acknowledges the multitude of the *ſpecies* of inſects not to be fewer, perchance more than twenty thouſand [h].

[h] Page 24 of the Creation.

In

In Cornwall, likely, we have more of thoſe inſects which require moderate warmth, ſooner and longer in the year, than in other parts of England where their colds and heats are more intenſe. I ſhall not dwell much upon particulars, but in general obſerve, that as little as theſe creatures are, many undiſcoverable to the naked eye, ſome ſcarce to be ſeen by the beſt conſtructed glaſſes, they have their uſe, and their neceſſary ſtation in the animal ſcale; the ſmalleſt are food to larger, the larger to others of a greater ſize, and theſe to the greateſt; theſe again to birds and reptiles afford nouriſhment, and ſome of them provide food, and phyſick for man; nay the very ſmalleſt inſects ſucked in imperceptibly with the air we breathe, by their better concocted animal juices, may ſerve to qualify and correct the acrimony of air, and thereby contribute to the ſpirit and rectifying of the blood; add to this, that the ſmalleſt inſect as juſtly raiſes our admiration, and as directly leads us to a firſt intelligent cauſe, as the ſtructure of a planet or the fabrick of the univerſe. By their inconceivable numbers, theſe ſmall creatures are the great inſtruments of divine juſtice, and are either the vehicles of peſtilence, or by their voraciouſneſs bring ſcarcity, famine, and deſtruction upon a guilty land. Their uſe.

Uſeful as theſe diminutive creatures are, they muſt have their allotted food; this food is uſually the leaf of flower, herb, or plant; hither in ſwarms they tend, fix, and eat, and neſtle their eggs; and when their multitudes are increaſed by wind or weather, conſume the bud, the bloſſom, or fruit they light upon. Blights therefore in the nurſery, fruit, and flower-garden, may with great juſtice be oftentimes aſcribed to ſwarms of voracious or poiſonous inſects, but I apprehend not always; the air itſelf being oftentimes charged with corroſive ſteams and noxious humours, is of a very cauſtick nature, and frequently ſcorches and ſhrivels the ſap-veſſels, and brings on decay. However, there are few plants which do not at one time or other ſuffer in ſome degree from inſects; nay, exoticks though they come from another climate, and one would think ſhould have been the appropriated food of exotick inſects, do not eſcape thoſe of this climate. Auguſt 20, 1750, finding the leaves of an orange-tree ſpotted as if mildewed, on viewing it more attentively I perceived on each ſpot an orbicular ſubſtance thin as the leaf, of one tenth of an inch in diameter; and upon examining it in a microſcope, it appeared to be cruſtaceous, in ſhape, colour, and tranſparent ſpots on the back, reſembling a tortoiſe; the belly-part ſoon confirmed it to be an animal; the edges of the ſhell were thick ſet with briſtles, by which I imagine theſe animals fix themſelves to the leaf on which they are diſpoſed to feed as well as fence themſelves from their enemies: beſides theſe marginal appendices, they Food.

have legs four times as long as the briſtles; there were no wings that I could perceive; but I do not aſſert that there were none: the leaf turns black in the place where this inſect faſtens [i]. Poſſibly this may not be a non-deſcript; I only produce it as an inſtance that the diſcolouring and decay of leaves, even in exoticks, is owing ſometimes to unobſerved inſects. Among the numerous tribes of inſects which have employed the attention of the curious, it is wonderful to obſerve, that every *ſpecies* has a different art (if I may ſo call the impreſſed inſtinct) of procuring its food, and preparing proper receptacles for its different ſtates of caterpillar, nympha, and fly: among them the ſpider cannot be ſufficiently admired for extracting its threads out of its own body; ſometimes it fixes, and makes that thread either its ſtreight rope to convey itſelf from one poſt to another, or by its extended ſurface ſpins the thread ſo much lighter than the air, as to float and bear up its author, till ſhe finds a place to fix in proper to her deſigns; at other times ſhe weaves the ſame thread moſt artfully into nets or webs for intercepting and fettering her prey. Still more admirable, as well as uſeful, is the bee; the frugality of ſpace, the uniformity of ſhape obſerved in the conſtruction of the cells and combs, her delicacy and choice of flowers which yield the beſt honey, her laborious collection of wax, the œconomy, policy, colonies, and the general abhorrence of lazineſs of this little inſect, are all evidences of an inſtinct, which (if it may not be called reaſon, circumſcribed, and applicable ſolely to the exigencies of one particular *ſpecies*) is the ſtamp, the ſeal, the impreſſion of reaſon from above. By the greateſt, ſtrongeſt, ſtatelieſt animals of the brute kind, we have no where a richer treaſure collected than that of the bee, more ſkilfully compoſed, a magazine more carefully ſecured, and more impartially diſtributed. But to return: The honey of Cornwall is reckoned good, and of a high flavour, as I have been informed by gentlemen of ſickly habits, who have preferred it to moſt Engliſh honey: this excellency is perhaps more owing to the multitude of our ſhores, where the bees are frequently ſeen intent upon the ſalt and brine which the ſea throws in upon the rocks, than to the nature of our heath and other paſture [k]. Of late years the burning-houſes, where the tin is roaſted [l], prove fatal to bees; thoſe that are within reach of the ſmoke languiſh, and are ſoon killed, having no liberty to range as the wind and variety of food determines them, without danger of ſuffocation.

Inſtinct.

[i] It ſeems of that kind which Mr. Hill calls Scelaſius. Hiſt. of Animals, page 10.

[k] It is obſerved in Hamſhire, as I have been informed, that the honey collected from the heath is but half the value of that which is gathered elſewhere.

[l] See page 134.

The

SECT. II.

Sea and water-insects, and their infinite numbers.

The number of water-insects is probably so much greater than that of land-insects, as there is more need of animal food (the chief end perhaps of such beings) in such a turbulent medium as water, than upon the land, where plants and seeds, and other nourishments of animals, are not so often destroyed, as in the sea, rivers, and lakes, which are subject to more violent motions. The multitude of these little animals is beyond conception, of which I shall produce but one illustration, which is, that the shining of the agitated surface of waters is most probably owing to a multitude of lucid animalcules, a phænomenon which, under this head of water-insects, must not pass unnoted. It has been long observed, that "if the sea-water be flashed with a stick or oar (as Mr. Carew, page 27, says) in the darkest night, it will cast forth a bright shining colour, and the drops resemble sparkles of fire, as if the waves were turned into flames;" this surprising appearance the Cornish sailors term Briny, and think it presages a storm; but it has no connexion either with a tempest or a calm; it is indeed the usual consequence of agitating the surface of the sea, though in different degrees in different places, and different seasons of the year [m]; in the summer "so very luminous in strong gales of wind near the isles of Cape Verd, that passengers have seen the very keel of their ship by it, and fishes playing underneath *."

We shall best be able to discover the cause of this surprising phænomenon, by tracing the same effect into different subjects, and placing the several circumstances relating to it under one view; for the same phænomenon has been observed by the curious in waters of lakes and moist places on the land, as well as in the waves of the sea. Dr. Plot mentions this luminous appearance in a moist spungy earth on a hill and in a ditch in Staffordshire, where the water, being disturbed, shined like embers, and covered whatever they touched with a faint flame like that of burnt brandy, which continued shining for a quarter of an hour †.

Dr. Cotton, May 25, 1664, gave the following account to the Royal Society of the like appearance in this County of Cornwall: "Returning from Lanceston with Sir J. Coryton, Baronet, to his seat Newton, in a misty, dewy night, at Hinxen, almost a mile beyond Callington in the Lanceston road, in a mooriſh place of some forty feet in length, the impress of our horses and our own feet upon the ground appeared fiery, much more fiery than glow-worms; the grass we gathered in those places where we or our horses trod, reserved the lustre in our hands, eer we came to the water within a quarter of a mile of Callington, where watering our

[m] "In the summer months it is most visible when the wind is south-east, or in any point betwixt south and east," says Dr. Plot, Staffordshire, page 117. * Ibidem. † Ibid. page 115.

horses

horſes we obſerved it, but almoſt extinguiſhed, only a ſpark here and there. At Newton, two miles thence, we viewed it by candle-light, as alſo the next day, and found it coarſe, ſpiry graſs, of an inch or little more in length, ſuch as ordinarily grows on downs [n]." The cauſe of this luminous appearance has been variouſly aſſigned; ſome have thought it owing to a certain bituminous matter thrown up by a fermentation, or ſteams aſcending from the bottom of the ſea [o]: But this is too limited a cauſe, and will by no means account for like appearances by land; indeed nothing of a bitumen appears, neither do waters of any kind become luminous unleſs firſt ſtirred and agitated, neither does kindled bitumen make ſo harmleſs a fire, nor continue ſhining ſo long, nor expire ſo gradually. Others have thought it part of that electric fire, which (as every one is now convinced) is diffuſed throughout the univerſe; but this electrical fire becomes only viſible by flaſhes, paſſing in inſtantaneous ſallies from one body to another, and immediately expiring; and a learned gentleman * (as I am informed) who had formerly eſpouſed this cauſe, concludes ingenuouſly from farther experiment, that this luminous appearance is not owing to electric fire produced between the particles of water and thoſe of ſalt, as he had firſt imagined, but to ſome other cauſe.

Dr. Plot (Staffordſhire, page 116) hints, that the ſhining of the mire and miry water, may be owing to a kind of glow-worm; thus the clammy moiſture of oyſter-ſhells which ſhines in the night of a violet colour, comes from luciferous worms that have their holes in the ſhells [p]; and this hint has been adopted, and farther purſued by ſome modern authors of reputation [q], who are of opinion, that this ſhining light is owing to a multitude of animalcules riſing to the ſurface of the ſea in the night, and throwing forth their light (like glow-worms) when they are agitated. This hypotheſis is confirmed by the late experiments of a learned Italian, Dr. Vianelli of Chioggia, who carrying home a veſſel full of the luminous water of the lake of Chioggia, and ſtirring it in a dark cloſet with his hand, found that it glittered much; but after filtrating it through a piece of coarſe linen, that it ſhone no more: the piece of linen however was covered with lucid particles, which in a microſcope he diſcovered to be animalcules entirely luminous [r]. In all the forementioned caſes of mire, lake, and ſea, there is none of this ſhining without water ſtirred: it is therefore an aquatic glow-worm [s] of a different element from that of the

[n] Dr. Birch's Hiſt. of the R. S. vol. I. pa. 431.
[o] Natural Hiſtory of Waterford, page 290.
* Mr. Franklyn.
[p] Ibid. from Mr. Auzout.
[q] Mr. l'Abbê de Nollet, and others.
[r] Since Vianelli another Italian author, Dr. Griſelin, has purſued and farther elucidated the ſame ſubject.
[s] It is called Nereis phoſphorans; aliàs, Scolopendra marina lucida.

land,

land, not diſperſed equally in all waters, but more or leſs in particular parts of land and ſea-water; that they do not ſhine without being agitated by the treading of horſes or men, or by the force of oars, rocks or ſhips, is becauſe, when at reſt, they mutually hide the luminous juices of their body, juices which ſhine in the dark, but cannot make that ſhining viſible till the throng is ſomewhat diſperſed, and the diſturbed inſects have room to exert and diſplay their luſtre. Why none of theſe waters ſhine in the day-time is obvious, the light of theſe little creatures has not force ſufficient to make itſelf perceivable among the ſolar rays; perhaps too, theſe inſects riſe to the ſurface of the water by night, and there gather themſelves together as the proper ſeaſon for aſſembling. Laſtly, that this harmleſs fire faints, and gradually expires in an hour, is owing to the death of theſe animalcules for want of their own element; they ſhine not after death.

If then this lucid appearance is owing to inſects, we cannot but admire the immenſity of this order of creatures, and revere that infinite fertile power which (to ſay nothing of what we find by land) has ſpread over the ſurface of the ſea ſuch a profuſion of animal life, couched in ſuch contracted and yet ſplendid bodies, that in one bay or creek there are inſects more in number likely, than all the quadrupeds upon the face of the whole earth.

SECT. III. Zoophyta marina. Polypes.

But from the number let us come to ſome of the moſt remarkable and larger ſorts, among which the ſea polype may challenge our next notice. Polypes are found in great number and variety incloſed in alcyoniums, corallines, corals, (Philoſophical Tranſactions of 1751 and 1752, vol. XLVII. page 101) marbles, and other ſtones [t], and, if I miſtake not, in ſome branchy *fucus*'s; for when they are fixed to the rock on which they grow, they have a moſt beautiful blueiſh purple at the extremity of the branches, but taken out of the water, appear of the brown common ſea-wrack colour; which alteration for the worſe, I attribute to the polypes, or ſome other animalcules contracting themſelves into their own cells as ſoon as they are taken from their proper element, and refer to further enquiry. In ſhort, there is ſcarce any plant or ſoft ſtone in the ſea without ſome polype or other in it, nature having provided thoſe creatures which have leſs of the locomotive faculty, with longer and more flexible tubes, and numerous feelers to reach after and apprehend their prey, than thoſe which can ken, purſue, and overcome it.

I ſhall next take notice of ſome zoophytes (whether polypes or not, perhaps may be queſtioned) which have reached my notice in

[t] Ibidem ut ſupra, page 68.

the alcyonium and the coralline. The alcyonium is of a middle nature betwixt the herbaceous and horny ſubmarines; its ſubſtance fleſhy, and ſometimes hard even to cartilaginous; ſhapeleſs at times; ſometimes tubular; generally inhabited by animalcules. Dr. Schloſſer before-mentioned diſcovered one of a curious make dredged up in Falmouth Harbour, September 18, 1755. The alcyonium was brown and thin, and was the *ground* in which the animals had placed themſelves in ranks, each in a roſe-like ſhape, making a kind of border round the ſtem of an old large *fucus*. The natural ſize of the flowers (of which there are three placed ſide by ſide) may be ſeen Plate XXV. Fig. I; one is magnified, as Fig. II; each roſe had from five to twelve, but more generally eight leaves, each leaf an aperture in it, (as at *a*, Fig. II.) which is ſuppoſed to be a mouth; in the centre there is an opening larger than the reſt, within which, when the incloſed animal was alive, ſomething like fibres were perceived to move; whether this creature extends thoſe fibres to lay hold of the food which the waves throw in its way, muſt be referred to future enquiry [u]. Somewhat different from this, though of the ſame tribe, was an alcyonium which I found on a ledge called Careg-killas, in Mount's Bay, where, as I was tumbling over the moveable rocks, I found one coated with a tranſparent, callous ſubſtance, ſpread on ſome rocks about ſix inches, in one near two feet ſquare at a medium: the coating was about the ſixth of an inch thick; the ground was dark green; the flowers conſiſted of ten obtuſe petals, which were of a vivid yellow green; each petal was in two places pierced of the *field* (as the heralds term it); that is, had two ſpecks in each (in this differing from the foregoing) which tranſmitted the colour of the *field*; the flowers and ground together made ſo pretty a piece of tapeſtry, that one might be ſurpriſed to find ſuch colouring and workmanſhip hid, as it were induſtriouſly, under a rock; but the works of nature are every where well finiſhed, and cannot be otherwiſe than exact and beautiful in their degree. Part of this coating, with its roſes in their natural ſize, may be ſeen Plate XXV. Fig. III. magnified, Fig. IV. Searching a little further I found a like congelation on another rock; the ground of this was of a warm brown colour (ſuch as the painters call Cologne earth); the petals of the flowers were ſharp pointed, not always of the ſame number, but from ſix to twelve; the flowers were radiated, irregular in ſhape, as may be ſeen Pl. XXV. F. V. magnified, F. VI. not pierced as in the foregoing, quite yellow, and on the brown ground looking like ſo many aſte-

[u] It was ſhewn me the day after it was dredged, and from a drawing then made, publiſhed in the Philoſophical Tranſactions, vol. XXXIX. part II. 1756, page 451, and is ſuppoſed to be a non-deſcript.

riſks

PL XXV.

SEA INSECTS.

pa. 254

I

II magni fied.

III

IV magni fied.

V.

VI magni fied.

VII

VIII

IX

X

XI

Scale of inches for the Sea nettles. except N°. XVI.

XII

XIII

XIV

XV

XVI

XVII

XVIII

XIX

XX

XXI

XXII

XXIII

XXIV

XXV

XXVI

XXVII

XXVIII

Small suck fish, Back.

Belly.

XXIX

XXX

3 veins of Asbestos.

Scale AA.

Loligo.

riſks of gold; but their beautiful colour immediately faded, though kept in ſalt water, ſo that they are to be ſeen in perfection only and drawn (as theſe were) on the ſpot, and when the alcyonium is fixed; when dried, they ſhrivel up like a piece of ſinged leather, and their ſubſtance ferments ſtrongly with *aqua fortis*. There is no doubt but theſe alcyoniums conſiſt of an arrangement of the jelly-like bodies of a certain animal determined to form in ſuch thin coatings upon the rocks. The ingenious Mr. Ellis [w] has ſhewn beyond contradiction that the corallines are pervaded in all their ſtalks and branches by polypes. Into theſe bodies (ſo adapted by their jointed ſtructure to float to and fro in the water, and to place them in the reach of their proper prey) they either inſinuate themſelves, excavating cells for their eggs, and ſtiffening tubes and paſſages for themſelves and their ſupple young ones, or according to another hypotheſis lately eſpouſed by gentlemen of great experience in this branch of ſcience [x], they form this coralline armature for themſelves from the very foundation, being taught their leſſon by the ſame Maſter who inſtructs the ſnail, the oyſter, and the belemnite to build according to the exigencies of their ſpecifical ſhape of body [*]. However that be, through the extremities of the coralline boughs they thruſt forth their *tentacula* or arms to ſeize their prey; they are ſo ſmall that they are ſeldom to be ſeen but in microſcopes, their prey is proportionably ſmaller and weaker, yet probably animals, and thoſe have other ſubordinate *ſpecies* of animal-food beyond the reach of glaſſes (for what elſe but animal-food can conſiſt of parts fine enough for their vital paſſages?); all theſe are furniſhed with life and motion, that whilſt they range in ſearch of their own food, they may diſperſe and gradually communicate animal nouriſhment to their ſuperiors in ſize and uſefulneſs to mankind.

Worms. Among a parcel of ſea-plants brought me March 24, 1752, I found a ſea-ſlug, ſmooth and ſlimy as the land-ſlug or dew-ſnail, pointing forth its eyes on its *antennæ*; it crept and claſped, contracted and extended itſelf, (as the ſnail) by its belly, but had this peculiarity, that it emitted at times a moſt beautiful purple colour; when it was almoſt dead, on dropping a few grains of ſalt on its back, it ſent forth the purple dye very plentifully. It ſeems to me of the Holothurian kind; of which Rondeletius treats, part II. p. 125.

Fig. XIII. Plate XXVI. is the long-worm found upon Careg-killas, in Mount's Bay, which, though it might properly enough come in among the anguilli-form fiſhes, which are to ſucceed in their order, yet I chuſe to place here among the leſs perfect kind of ſea-animals: it is brown, and ſlender as a wheaten reed; it meaſured five

[w] F. R. S. London, Hiſt. of Corallines, printed in London 1755.

[x] Mr. Ellis, before-mentioned, and others.

[*] See page 242, before.

feet

feet in length (and perhaps not at its full ſtretch), but ſo tender, ſlimy, and ſoluble, that out of the water it will not bear being moved without breaking; it had the contractile power to ſuch a degree, that it would ſhrink itſelf to half its length, and then extend itſelf again as before. But to run through all the ſorts of worms, the *Tethys*, the *Lernæa ſcolopendra*, *Pulmones*, *Fungi*, and others, would be remote from my deſign, ſome few enquiries to excite curioſity may here be ſufficient, and a great deal, after entering into the *minutiæ*, would be ſtill incompleat. *O mare, O Littus! verum ſecretumque* Μʊσεῖον! *Quàm multa invenitis, quàm multa dictatis*[y]?

Sea-nettles, or Urticæ marinæ.

Of ſea-nettles (ſo called from the pungency with which they affect the hand, not very unlike to that of the land-nettle) we have the *Urtica rubra Saxo innata Aldrovandi (Tab. de Zoophytis*, N°. VII.) in almoſt every pool on the ſea-ſhores, and alſo the *Urtica rubra Rondeletii*, (page 530, lib. XVII. chap. XVII.) In ſome caves in the pariſh of Piran-Uthno, waſhed often by the tide, I found ſeveral; in colour they varied from the fineſt ſcarlet four degrees down to the deepeſt purple, finely powdered with yellow ſpecks, which, as the animal expired, became more pale and lanquid. Theſe animals are as energetick with the claſpers by which they fix themſelves to the rocks, as by their arms which are continually waving to and fro in ſearch of food.

Of ſea-nettles, unfixed and *nayant*, I have obſerved the following variety:

The *Urtica marina*, Plate XXV. Fig. VII. is called *Meduſa*. I have not found it fully deſcribed, and therefore I ſhall be more particular in my account of it: Its figure is round, its back convex, marked in the centre with a ſeeded circle, *a*, of an auborn colour; at three quarters of an inch diſtance from the circle begin the ſixteen rays, *b b*, which point inwards to the centre, and divide into two branches or legs as they tend to the circumference, each leg terminating in a little egg-like knob, *c c*, half an inch long, one fourth of an inch diſtant from one another: after this inſect had reſted about half an hour in the diſh I placed it for view, a hamous, crooked, little fang, *d d*, appeared and was protruded betwixt each knob, as in the figure: the ſubſtance was a kind of jelly fleſh, in the middle hard and cartilaginous, the circle and rays were auborn, the body ſomewhat clouded for an inch and a half round, and under the central circle, but of the moſt perfect cryſtal tranſparency every where elſe: its body was one inch and a quarter thick; from the convexity, it deſcended quick near the *limb*; ſo that the egg-like knobs, *c c*, ſpread horizontally. In the centre of the under part

[y] Pliny Junr. to Fundanus.

of

of the ſame fiſh, Fig. VIII. was the mouth, *e e*, in the figure of a croſs, which cloſed or opened as a ſtrong muſcular *labium* at each angle of the croſs did operate; at each extremity of the *labia* was fixed a leg or a *tentaculum*, *f f*, about a quarter of an inch thick, flat in ſubſtance, auborn in colour, between three and four inches long (perhaps maimed); at the baſis, where theſe joined the body, they were larded or fanged by part of the ſame cryſtal jelly as that of the body, flat as a fin; within the mouth was a cavity of about four inches diameter, where its ſuſtenance with its bowels was lodged [z].

Fig. IX. ibid. is the back of another variety of the meduſa kind. It is convex in the middle, but ſlopes away quicker than the former at the edge, which is thin; in the centre it has a pale purple croſs, *g*, of four pointed rays, between which there are four bell-like foliages of the ſtrongeſt purple; from the extremities of theſe foliages proceed rays of a faint purple diverging to the circumference. In the belly of the ſame fiſh, Fig. X. there is a croſs-like opening made by the convention of four triangular muſcles, *i*; and at each commiſſure of theſe muſcles there is a fang or leg of the ſame tranſparent ſubſtance as the body; with theſe legs, I apprehend they raiſe themſelves from, or ſtick cloſe to, the place where they chuſe to reſt, reach, and convey the food to the mouth, uſe them as fins to ſwim, or as legs to walk through the paths of the ſea.

Fig. XI. ibid. is another variety of the meduſa's, and differs from Fig. VII. before deſcribed in the following particulars: It has no circular *nucleus* in the middle, but a ſeeded ſpot only; its rays are ſolid, and not divided into lines. I could perceive no hamous fangs at the *limb*; its *tentacula* or legs, *m m*, being extended, ſpread fourteen inches, as in Fig. XII. which is the under part of this meduſa.

Fig. XIII. is another variety: It has no colour but that of the pureſt cryſtal jelly, oval in figure, on the back it is convex, and on the under part, Fig. XIV. has four ſeparate cavities, but no fang, tentacle, or other projection.

Fig. XV. is the belly view of another *Urtica* of the ſame kind as the laſt (as I imagine), but adult and perfect, found on the Mount's Bay ſhore, Auguſt 2, 1757, which I have never ſeen deſcribed: Its brim much thinner than the other parts to further its motions, ſcolloped, edged with fang-like appendixes at the ſeveral protuberances, *a b*, and two others, (the reſt probably broke off). The holes, *c c*, are the four mouths or inlets into the *abdomen*, ſupplied with muſcular excreſcencies which ſerve to cloſe them occaſionally. It had eight legs, *d d*, all dependant from a ſtem or ſtalk, *e*: this ſtem is

[z] Qu. an Urtica aſtrophyta Linnæi, Syſt. Nat. Spec. 4 Gen. Zoophy. page 237.

dreſſed round with fourteen fangs, *f f*; the back is round and convex, like that of the reſt; the whole tranſparent, colourleſs, and cartilaginous; and to diſtinguiſh it from the reſt, may be called *Urtica marina ex trunco octopedalis limbo imbricatim undante*. Theſe five are deſigned by the ſcale, A A.

But the moſt beautiful of this kind which I have met with, and as far as I can learn has not been yet deſcribed, is Fig. XVI. ib. p. 254, which, being large, is here deſcribed by the ſcale, B B: It is all of the moſt pure cryſtal jelly; ſome have a greeniſh caſt; the margin is formed by little ſemicircular fangs about half an inch diameter, and as much diſtant from each other; tranſparent as the reſt, but that at their very brim they are tipped with a very beautiful blue. Four ſcutcheon-like figures, *e e*, aptly joining their baſe points, form a ſlender *ſulcus* in the form of a croſs at the center; four figures in the form of a heart, fill the vacancies between the ſides of the ſcutcheons; from the circumference of this compounded *nucleus* proceed ſixteen notched fangs, *d d*, contiguous to each other at their baſe; on the outſide of which at every *ſulcus* betwixt the ſcutcheons and the heart-like appendixes are inſerted the legs or tencles in number VIII; they are here turned back and diſplayed *b b*; thoſe parts of the legs next the body (which is here marked *c c*) are flat; but what is next the eye is divided into three blades about three quarters of an inch thick, jagged, carved, or furbelowed at the edges, but the lower part, *f f*, flattened like the blade of an oar, with three angles for the better cutting the water, as may beſt be apprehended from the icon: between theſe legs are eight creſcent-like mouths, *a a*, which have a bunch of jelly at their aperture to cloſe and open them; all theſe mouths are inlets to one common opening which extends within the central *nucleus*, making a circular cavity, the dimenſions of which may beſt be ſeen at *e e e*, in Fig. XVII. within this cavity are the inteſtines, conſiſting of a continued ſeries of gut, yellow without, faſtened to the body by a common membrane of about three inches deep, on which the guts are dependant: Fig. XVII. repreſents the back of this creature with the legs *pendant*, as Fig. XVI. repreſents the various imagery of the under part. Till I am better informed of a name, I ſhould call this *Urtica marina octopedalis octo faucibus et variis appendicibus ventralibus diſtincta*. It was found on the ſandy beach betwixt Penzance and Marazion 1756.

Theſe creatures ſwim obliquely, contracting alternately, and expanding their brim and promoting their reſt and motion by the legs which they are ſupplied with: their motion however cannot be ſwift, which makes them an eaſy and probably a nouriſhing and delicious prey to larger fiſh; but they are ſometimes eaten by man.

Rondeletius,

Rondeletius, page 532 and 533, has given us (but very different from any here deſcribed) two of the *Urticæ ſolutæ*, whence they are copied into Aldrovandus's Table XVIII. de Zoophytis, Natural Hiſtory, page 187. Some call them Blobbers; the Corniſh name is *Morgoulis*.

Of the *Stella marina*, or ſtar-fiſh, Mr. Lhuyd found one near Penzance, which he calls *Decempeda Cornubienſis*. (*Linckii Tabula* XXXVII. N°. LXVI). This is very rare; for in Cornwall this animal has generally but five rays. Of this tribe we have varieties, as the Echinaſter, or *Stella coriacea pentadactyla echinata Luidii*; *Linckii*, Tab. IV. N°. VII. In this ſort the briſtles of the back are high and ſpinous; part of one (if I do not miſtake) may be ſeen Plate XXV. Fig. XVIII. The following ſix are of different colours, the central boſſes or *fibulæ* variouſly embroidered, and the rays of different workmanſhip. Stellæ marinæ, or ſtar-fiſh.

Fig. XIX. ibid. is entire; the *Aſteriſcus, ſeu ſtella marina pentadactyla exigua lutea vulgaris*, from the ſea-ſhore of Ludgvan; the rays, when the fiſh was firſt taken up, extended five inches and a half, were ſtiff and round, but by the next morning flatter, lank, and enervated, extending ſix inches and a half in diameter; in the under part a pentagonal *nucleus* occupied the centre, from each angle of which branched off a ridge of *papillæ pyramidales*, with ſharp horny points, running nearly in the middle of each ray; the ground-colour was cinereous, tending to a purple; the *mammillæ* of a brick colour, the point of the rays a deep purple; but when dead, of a brown yellow; on the belly-part each ſide of the rays had ſtrong hard briſtles ſhooting tranſverſely, between which there was a great number of tranſparent, ſoft, fleſhy tubes, or *antennæ* with ſmall knobs at the extremity, which began to move and exert themſelves, as ſoon as the fiſh was laid on its back; with its rays it crawls like a crab: the uppermoſt briſtles of the rays ſeem deſigned for defence, and perhaps to aſſiſt its motion; the *antennæ* of the underpart (which it ſhoots forth and contracts like the horns of a ſnail) ſerve to move it to and fro (perhaps to ſee and reach its prey), and fix it alſo when and where it chuſes to reſt.

In Fig. XX. the light parts are of a bright-yellow ocre, the dark part brown-red, of different degrees, intermixed and figured as in the plate; the rays three inches long.

In Fig. XXI. the *fibula* is of an olive green of different degrees; the ſtem of each ray is diſtinguiſhed by a lozenge, and ſtudded; that is, divided into ſquare compartments, alternately red and Naples-yellow, twenty red ſpots in each ray; the rays two inches and a half long.

In Fig. XXII. the *fibula* is of a black *ground*, ſtriped with leaves

leaves of a bell-like figure, with milk-white pointed javelins at the inſertion of the rays which are of a brown, ſpeckled green; the ſtem marked with tranſverſe lines; rays three inches long. One of this ſort (that is, with leaves of the *fibula* ſhaped in like manner) has a yellow *fibula*; but the ſtem of the *radius* is diverſified by ſquare compartments, as in Fig. XXI; rays two inches and a half long: A third has no javelins at the inſertion, but the bell-like leaves with a whitiſh *nucleus* in the centre, and the ſtem of the ray cut into ſquares of the richeſt ſcarlet intermixed with green; rays three inches long. In Fig. XXIII. the *fibula* is black, pentagonal, interſected by five white ſlips (of the figure of a Lens) running from the ſtem of the ray to the central *nucleus*; the rays of an olive green, ſtudded with dies of a darker colour. In Fig. XXIV. the *fibula* conſiſts of five petals only, the outer edge of which is a brown Cologn-earth, lightning into a yellow in the middle; the rays are diſtinguiſhed by two rowes of dies, one on each ſide of the ſtem, the dies oppoſite, and of a dark green; another with like rays has the like *fibula*, but of a ſky-blue colour; rarely met with.

Fig. XXV. is the back of a *Stella marina ſaxis infixa*. Fig. XXVI. the belly-part of the ſame with which it ſticks to the rocks; it was of a fleſh-colour; they are all of the ſame ſize I found them on Careg-killas near Penzance, October 8, 1756. Some other little differences occurred; but theſe are ſufficient to intimate what diverſity of colourings and workmanſhip may be met with in this tribe.

Sepia, or cuttle-fiſh.

On the ſhores of Mount's Bay we frequently find the cuttle-bone of the ſepia or cuttle-fiſh, or ink-fiſh, by which it appears that the ſepia of Rondeletius, page 498, though reckoned rare on the Engliſh coaſt, is not ſo uncommon on the ſhores of Cornwall: Its bone is uſed by the ſilverſmiths in poliſhing, and ſometimes admitted into the ſhops among tooth-powders, &c. Galen and others think theſe ſoft fiſh very nouriſhing, eaſy of digeſtion, and great attenuators of the blood [a].

Loligo, or ink-fiſh.

Fig. XXVII. Plate XXV. is the Loligo [b] found in Mount's Bay 1757; and being a fair entire ſpecimen of this uncommon animal, I add the following deſcription: The body is eleven inches long, compreſſed, one inch and a half thick, ſpreading on each ſide into a thin, triangular, fleſhy ſubſtance, *a a*, which ſerve as fins in water, and as wings in air; the tail much more obtuſe than that of Rondeletius page 508; the head, *c*, is globular, one inch and a half high; it had ten tentacles, *d d*, of various lengths; the two longeſt, *e e*, are pedunculated, not extended to their full length, their ſtems round, and near the extremities their upper ſide ſpread

[a] Rondel. chap. II. lib. XVII.

[b] Loligo minor Rondel. page 508. Salviani major Aldrov.

with

with tubular cups of the ſame fleſhy ſubſtance as the ſtem; they end in certain nipples or tubercles: the other *tentacula* are more flat and wide; they have one edge alſo full of theſe nipples, with a few cups in the middle of them; of theſe cups I apprehend the fiſh expands, and contracts the brim for the reception or emiſſion of the air, and fixing itſelf by ſuction to rocks or plants, as well as for laying faſt hold of its prey: the *tentacula* are both arms and feelers, and by the membranous and tender ſtructure of their tubes, doubtleſs of moſt acute ſenſe; by the recurve figure in which they ſtiffen as the animal dies, they appear alſo to quicken the motion of ſwimming by their alternate extenſion and contraction. This fiſh contains inwardly a certain juice ſo black in ſome of the kind, that it may be uſed for ink [c]. Pliny thinks it the blood of the animal, but by later diſcoveries it appears to be an excrementitious ſecretion from the aliment, which from its own repoſitory the animal ſheds when under the apprehenſion of any imminent danger, and thereby diſcolouring the water, frequently conceals himſelf from his enemy. The Athenians held this fiſh very cheap, but now the ſmaller ſort eſpecially is much coveted, and by ſome placed among the greateſt delicacies of the table, when ſeaſoned ſkilfully with oil or butter, pepper and wine; but Rondeletius thinks them hard of digeſtion, lib. XVII. chap. V. This ſpecimen had one bone in the middle like the blade of a dagger (therefore called its *gladiolus)*; its uſe is to ſtiffen the ſoft and lax fleſh of the body; it had plenty of ink, and was found on the ſands of Mount's Bay 1756.

CHAP. XXIII.

Of Fiſh.

FROM the leaſt and ſeemingly moſt imperfect ſea-animals, but equally neceſſary in their degree, we are gradually arrived to the moſt perfect inhabitants of the ocean.

And if I were here to ſet forth an orderly arrangement of fiſhes in general, I ſhould trace them through the ſeveral claſſes into which nature has ſorted them, by lungs and gills, by bones and cartilages, by the number, ſhape and place of fins and teeth, by the ſcaly armour of ſome, and by the mucilaginous ſmooth coating of others; but as my plan is local and more confined, I find myſelf only engaged to purſue the finny race through the waters of this

[c] Rondeletius, page 501.

county, as they were before divided into rivers, lakes, and ſea, and with as much order as theſe departments will admit.

SECT. I. River and lake-fiſh.

In our rivers, beſides eels and minies, and other leſs conſiderable, we have the ſhote [d], a ſmall kind of trout, but in ponds growing to about twelve or fourteen inches long, and by ſome reckoned [e] in a manner peculiar to this and its neighbouring county: the fleſh is white and leſs firm than that of the trout: it is common in all brooks which are not infected with the mundic-waters of our mines, waters fatal to all fiſh ſooner or later, but much ſooner to thoſe which delight in clear running water as the ſhote does. This fiſh may be ſeen in Willughby's Tab. N. 4, Fig. 2, but indeed not to advantage.

In our Corniſh rivers we have not the jack, perch, carp, cray-fiſh, or others with which Providence hath ſtocked the rivers in the more inland parts of Britain, as it were to make amends for their being ſo diſtant from the much greater variety of ſea-fiſh; but of the trout kind we have ſeveral ſorts, and in their ſeaſon in great plenty. In the laſt age there was a remarkably good one in the river Conar, which divides the pariſh of Camborn from Gwinear and Gwythien; but the many mines which have been of late years wrought in the neighbourhood, have deſtroyed this fiſh. In the rivers Alan and Laine, near Pendavy, they take a grey trout in the ſummer time, the fleſh of which is red and delicate. In the river Fawy, near Loſtwythyel, is taken the black trout in the month of May, and till the latter end of June, ſometimes three feet long; in July the ſalmon-pele comes up the ſame river, but is more commonly caught at the mouths of rivers, and in the ſea-waters, than in the rivers themſelves; and about the latter end of Auguſt ſucceeds a trout, called, from the time of its appearing, the Bartholomew Trout, not ſo large as the black trout, being about eighteen inches, rarely more; it is deeper in the belly, cuts red, and is eſteemed by ſome before the black trout, and both before the ſalmon. The ſalmon is properly a ſea-fiſh, and comes only occaſionally into the river, as to a place of more ſecurity from ſtorm and enemy, to caſt its ſpawn, on which it is ſo intent, that it will go up into large rivers four or five hundred miles [f], then returns to the ſea as its proper element, but muſt be placed here, becauſe the rivers generally afford us this fiſh. It is caught in the river Fawy at two Wears, one belonging to Lanhidrock, the other to Glyn, from the the latter end of the ſpring to the end of autumn. The ſalmon is taken alſo in the ſeaſon in great plenty at Lord Edgcumbe's Wear

[d] Trutta fluviatilis minor. [e] Carew, page 26. [f] Ray's Creation, page 130.

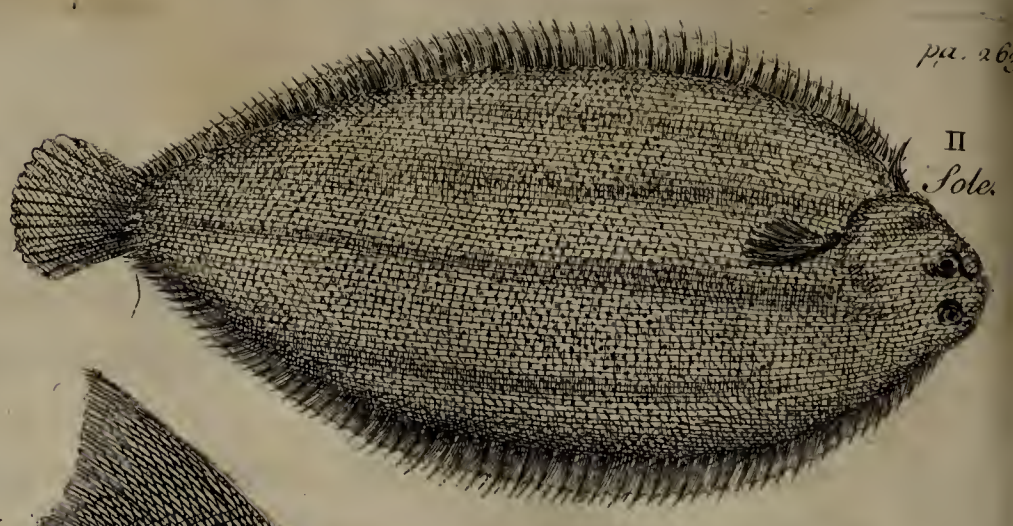
at

I

Lo Trout.

II

Sole.



III

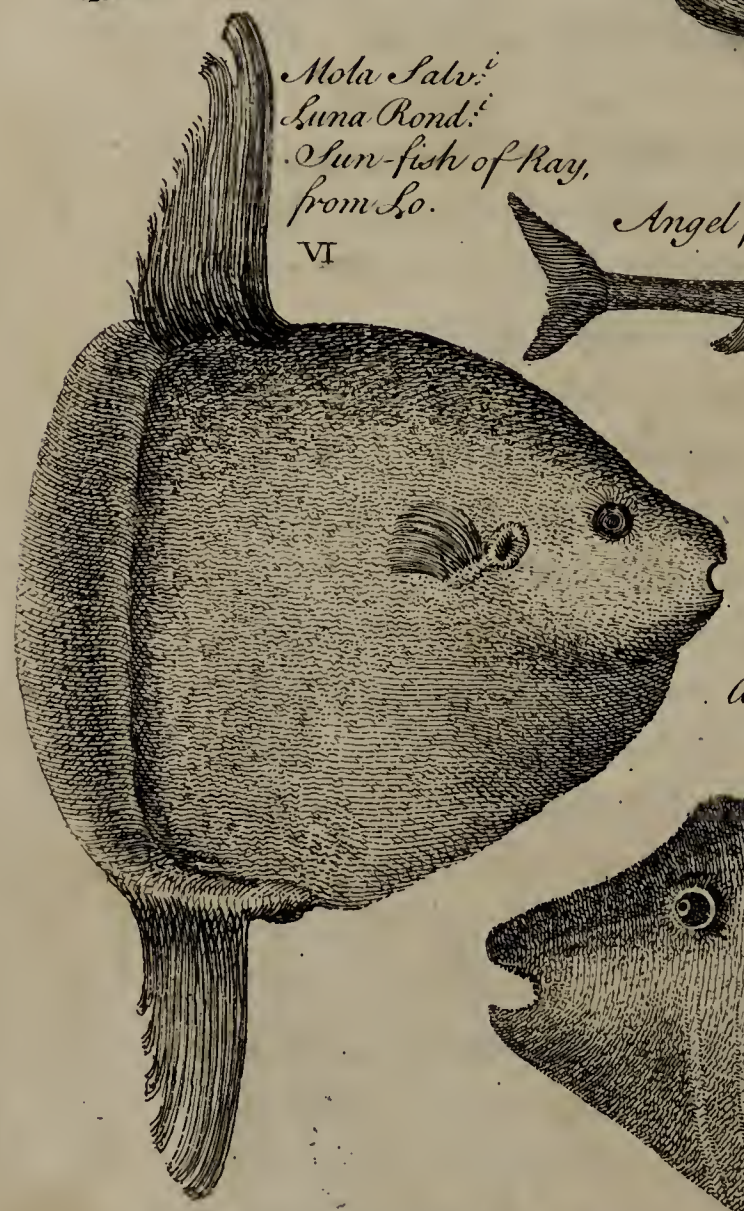
The Weever, Draco marinus or Sea dragon.

IV

The Porbeagle a small Shark.

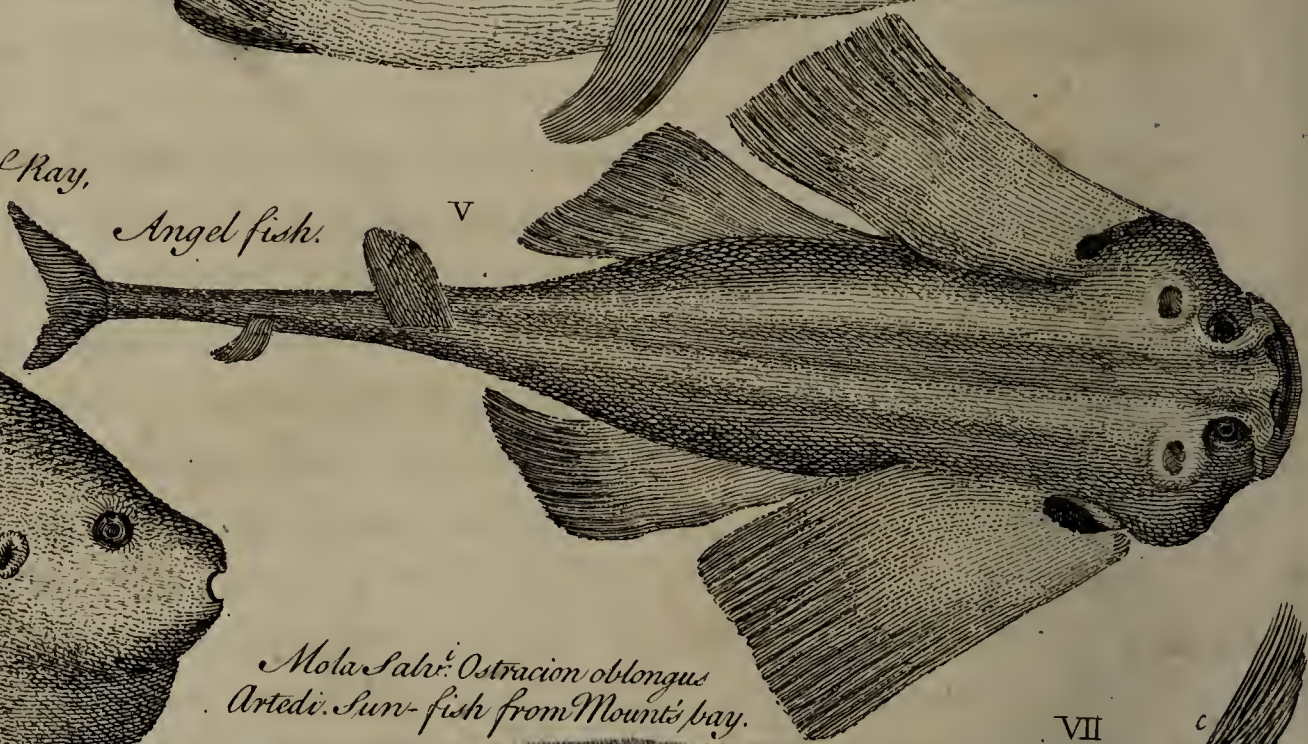
Mola Salv.i
Luna Rond.i
Sun-fish of Ray, from Lo.

VI



Angel fish.

V



Mola Salvi. Ostracion oblongus Artedi. Sun-fish from Mount's bay.

VII

VIII

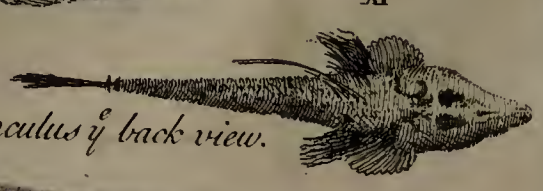
Black fish.

Lupus marinus Aldrov: Ang: abasse. IX

X

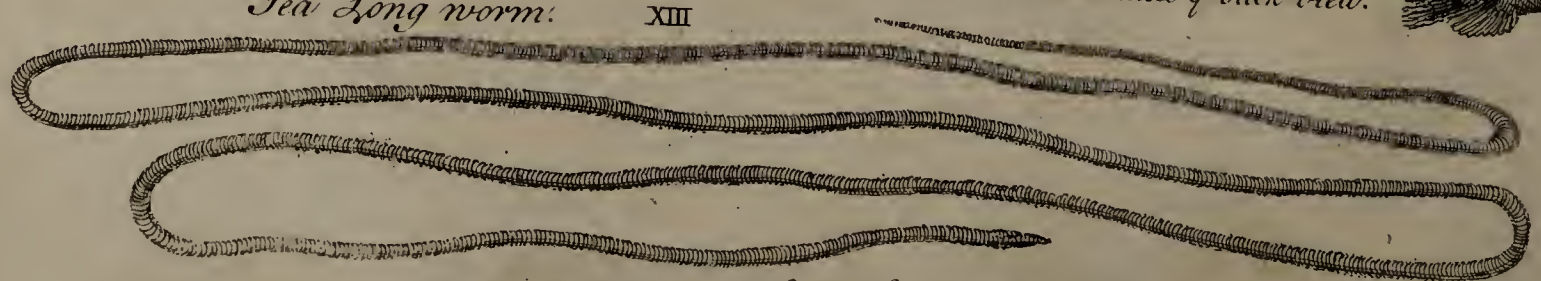
Dracunculus marinus Rond: side view.

XI



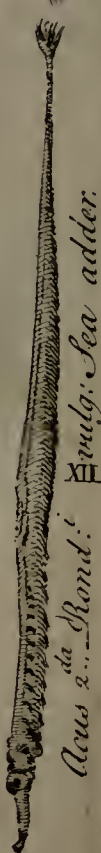
Dracunculus ♀ back view.

Sea Long worm: XIII



1 2 3 4 5 6 7 8 9 10 11 12 Inches.

XII



Anus Da Rond.i Vulg: Sea adder.

at Cûthel, on the Tamar, and near Bodman, on the river Alan, at a wear of Mr. Flammock of Boſcarn.

The Lakes in Cornwall are but three; Doſmery Pool yields only eels; the Swan Pool, near Falmouth, eels very large and good, with a mixture of ſmall ſea-fiſh; but the Lo Pool, in Kerrier hundred, nouriſhes a trout, which deſerves more particular notice. Of this the icon may be ſeen with the ſeveral parts by meaſurement, Plate XXVI. Fig. 1. The eye is large, the back of a deep black purple, on which the ſcales of a ſilver hue; the belly, from the ſtraight line which paſſes from the gills to the middle of the tail, of a bright pearl colour. The ſpots are hexagonal annulets of a ſcarlet colour in general, but purpliſh on the back, pierced of the *field* they ſtand on; the anterior back-fin has thirteen ſpines, wavy at the top, with ſmall tender points; the poſterior back-fin is entirely carneous, without any ſpines; the gill-fins foliaceous in ſhape, with twelve ſpines; the belly-fin ſmall, with nine ſpines; the anus-fin nine ſpines; the tail-fin remarkably large, and very little forked; the fleſh very red in the ſeaſon, and much eſteemed. The ſalmon-pele above-mentioned is very different from this trout, being more circular in the back; the lower mandible rather longer than the upper; the belly more ſilvered; the body deeper, and leſs round; the gill-fin and anus-fin leſs in proportion; the belly-fin larger, and the tail more forkled. This is perhaps a larger ſort of the *ſalmulus Baltneri*. Will. Tab. N. 4, Fig. 3.

SECT. II. Sea-fiſh, and firſt cetaceous.

The ſea is the great ſtore-houſe of Cornwall, which offers not its treaſures by piece-meals, nor all at once, but in ſucceſſion; all in plenty in their ſeveral ſeaſons, and annually, as it were to give time to diſpoſe of what is ſent; and yet in ſuch variety, as if nature was ſollicitous to prevent any exceſs or ſuperfluity of the ſame kind.

Of the *Balæna* or whale kind (that I may follow the uſual order of Ichthyologiſts) we have the blower or fin-fiſh (the *phyſeter* of authors) ſo called by the antients from the quantity of water which, from its mouth, it blows aloft into the air through a pipe or hole in the head adapted to this particular uſe. *Balæna edentula corpore ſtrictiore dorſo pinnato.* Ray, Syn. page 9.

The grampus, or *Porcus marinus major* of Ray, page 15; the *Delphinus roſtro ſurſum repando dentibus latis ſerratis* of Artedi*, page 106. It is uſually about eighteen feet long, ſometimes large enough to weigh a thouſand pounds weight; ſo voracious, that it will prey upon the porpeſſe itſelf, though of its own likeneſs. Ray, ibid.

* A late learned Swede, whoſe accurate account of fiſh was publiſhed after his death by Dr. Linnæus.

The

The porpeſſe, *Porcus marinus ſeu Phocæna vel Turſio*; *Delphinus corpore fere coniformi, dorſo lato, roſtro ſubacuto*, Artedi, page 104. I have given an icon of this fiſh Plate XXVII. Fig. 11. from a drawing of that accurate Ichthyologiſt the late Reverend Mr. Jago of Loo. It muſt be acknowleged by the greateſt admirers of Mr. Ray and Mr. Willughby, that the fiſh in their work are very imperfectly engraved. What is remarkable in this icon here inſerted is, that the dorſal-fin points forward to the head, and ſlopes away backward; a ſingularity which I have never yet ſeen taken notice of in authors, and which ſo accurate a deſigner of fiſh as I have reaſon to think Mr. Jago (from his drawings, as well as Mr. Ray's character of him in his Synopſis Meth. Piſc. page 162), could not, I ſhould think, miſtake; yet is the direction contrary to nature, and I have no other authority as yet for placing it thus, but that of Mr. Jago[g]. It is called *Porcus-piſcis*, or porpeſſe, from the copious quantity of lard with which all its body is ſheathed, and underneath this lard the fleſh is red like that of a hog: it alſo reſembles the hog both in the ſtrength of its ſnout, and alſo in the manner of getting its food by rooting. Ray's Creation, page 140.

The dolphin, the *Delphinus* of the ancients and moderns (Ray, page 12). *Delphinus corpore oblongo, ſubtereti, roſtro longo acuto* of Artedi, page 105. It is in many particulars like the porpeſſe, but longer, more ſlender in body, more white in the belly-part, and ſpotted; not ſo broad on the back; its ſnout more projected, and ſharper, ſomewhat like the beak of a gooſe; add to this that its dorſal fin (quite contrary to that of the porpeſſe) ſlopes forward towards the head, with its apex pointing backward, like the fins of other fiſh. I have given an icon of this, Plate XXVII. Fig. 1. from a drawing found among the papers of the late Mr. Jago abovementioned[h]. Theſe four cetaceous fiſh prey upon the pilchard and the mackrel, and in fair weather, when ſuch large fiſh can venture into ſhallow water, the porpeſſe purſues them near the ſhore.

SECT. III. Of long cartilaginous fiſh, among others we have the blue-ſhark deſcribed by Mr. Ray, Willughby Ichthyol. lib. 3, chap. 3. This fiſh haunts the Corniſh coaſts all pilchard-ſeaſon, and though greatly inferior in bulk to the white ſhark[i], is ſo great an enemy to the fiſhing-nets, that the fiſhermen have large hooks made by the

[g] This gentleman intended a hiſtory of our Corniſh fiſh, as Mr. Ray ſays, ibid. but it is feared that his notes and obſervations are loſt, which the curious will always regret; the few drawings which were found were kindly communicated to me by the Reverend Mr. Dyer, Vicar of St. Clare in Cornwall, and Chaplain of Eaſt Loo; and what are rare, and not already publiſhed in the end of Mr. Ray's Synopſis piſcium, are inſerted in this work with proper acknowledgements.

[h] From its high dorſal fin, this fiſh is ſometimes in Cornwall, but very erroneouſly, called the Thorn-back.

[i] Canis carcharias ſeu Lamia Auth.

country

LARGE FISH.

Scale for these fish. 1 2 3 4 5 6 7 f.t

pa: 264.

I The Dolphin.

II Porpesse

IV Turtle.

III Frog-fish.

V Fossil Horn. Nat: size.

VII Corallium tubulatum fasciatum p. 241.

VI Frog-fish of Mount's bay

country ſmiths on purpoſe to catch them; they breath through holes or pipes on each ſide betwixt the mouth and the pectoral fins, not through gills.

Of the ſhark kind (beſides others[k] which have been reckoned by Mr. Ray, who came to Penzance on purpoſe to collect and examine the ſorts of our Corniſh ſea-fiſh) we have the ſea-fox, *Vulpecula*, or *Simia marina* of authors; this ſhark we call the Threſher, from the motion of its long fox-like tail with which it ſtrikes or threſhes its larger and leſs agile enemy the grampus, whenever it reaches to the ſurface of the water to breathe. This engagement laſts ſeveral hours as I have been informed by an eye-witneſs[l].

We have alſo another ſhark, which we call the Porbeagle, of which I give an icon Plate XXVI. Fig. IV. from Mr. Jago, it being very different in ſhape from any in Willughby, or any other Ichthyologiſt I have examined.

Of the flat and broad, cartilaginous and ſpinous, beſides the more common ſkates and flaires, which we call rays, we have one in Cornwall called the Cardinal Triloſt[m], or three-tailed ray; ſecondly, a Britton or Burton ſkate without any ſpines, excepting only a few on its tail; the *Raia oxyrinchos lævis* of Jago; Ray, page 165. SECT. IV. Flat fiſh, broad, &c.

The monk or angel-fiſh, (otherwiſe termed the Mermaid-fiſh, as Artedi ſays) the *Squatina Rondeletii*, page 367; Ray, page 26; of which uncommon fiſh, of a middle nature, partaking both of the dog-fiſh and ray, I add the icon, Plate XXVI. Fig. V. Two of theſe fiſhes, one four feet ſeven inches long, the other ſmall, were taken in a tramel-net at Penzance, July 11, 1757. That here deſcribed is of a middle ſize, the belly white, the back of the colour of a ſole, without ſtreaks of white, as in a drawing I have ſeen of Mr. Jago, and without the *Linea aſpera* in the middle of the back, as in Rondeletius, lib. XII. chap. XXI. and Mr. Ray, page 27.

Among the papers of Mr. Jago, I met with an accurate drawing of the *Rana piſcatrix* of Rondeletius, Willughby, and Ray, &c. the *Lophius ore cirroſo* of Aredi, (G. Piſc. 41) which, becauſe it is little known, and not faithfully repreſented in the books I have ſeen, I have given the icon of, Plate XXVII. Fig. III. adjuſted to the ſcale of the dolphin, &c. with the exact number of the appendixes at the edges, and ſtiffenings of the pectoral fins according to Jago. But very different is the *Rana piſcatrix* (Anglicè frog-fiſh, or ſea-

[k] The tope, picked-dog, ſmooth or unprickly hound, bounce, aliàs greater cat-fiſh, in the Corniſh, morgi, that is, ſea-dog, &c. Ray, Syn. page 20.

[l] The Reverend Mr. Dyer, Vicar of St. Clare.

[m] In the Corniſh language ſignifying three tails.

devil) repreſented Plate XXVII. Figure VI. found on the ſhore of Mount's Bay, Auguſt 9, 1757. It had no fin-like appendixes round the head as that of Rondel. lib. XII. page 363, and that of Mr. Jago, but only on the tail part, interſperſed at the ſides from the beginning of the dorſal-fin to within two inches of the inſertion of the tail; they were three quarters of an inch long; it had more capillaments and aculei than Mr. Jago's, and a longer rounder body than that of Rondeletius; it had ſpines at the end of the pectoral fins an inch and three quarters long; ſpines alſo at the extremity of the tail three quarters of an inch long: the head in general more bony, rough, and aculeated than in either of thoſe authors.

The Turbot, aliàs Brett, *Rhombus maximus aſper non ſquamoſus*, (Ray, page 313) is an excellent fiſh, comes in the ſummer and autumn months, and in ſuch plenty ſometimes in Mount's Bay, that two boys have taken thirty of them in an evening with hook and line.

We have alſo the *Rhombus non aculeatus, ſquamoſus*, called at London the Pearl, in Cornwall the Luga-leaf. Ray, ibid.

Beſides others found here by Mr. Ray, as the plaiſe, dab, flounder, Mr. Jago (Ray, page 163) mentions the kitt, the *Rhombus lævis Cornubienſis maculis nigris creberrimis reſperſus pulchrioribus quibuſdam interlucentibus*; the fleſh nearly as good as that of the turbot.

We have alſo the whiff, the *Paſſer Cornubienſis aſper* of Jago, ibid. of which the fleſh is good for nothing.

We have alſo the holibut, the *Hippogloſſus* of authors: this largeſt of the flat kind is rare: there was one taken in Mount's Bay in February 1756; the colour dark green, ſcales ſmall, body longer, larger, leſs ſquare than that of the turbot.

The ſole is frequently catched on our ſandy ſhores, but rather larger on the ſands of Scilly than in Cornwall. Finding the prints in general of this fiſh defective or redundant in ſome particulars[n]. I have given an icon of it Plate XXVI. Fig. II. with its ſpines numbered, from a fair ſpecimen of Mount's Bay.

We have alſo the *Solea lævis, vel arnogloſſus*, called the Lantern by the Corniſh (ſays Mr, Ray, page 34) from its tranſparency.

SECT. V. Fiſh, round, long, &c.

Of ſea-fiſh round, long, and of the eel-form, in Cornwall the conger or conger-eel may be reckoned firſt: We have alſo the free-

[n] In Rondeletius the mouth is neither rightly ſhaped nor placed; the branchial fin is too large, and not ſpotted black at the end; the ſide line is too large, and continued to the upper eye; whereas it is indeed a ſtraight ſlender line from the middle of the tail to the under or left eye, and ends at the cheek-bone, and the mouth winds round cloſe under the right or upper eye; and in him the tail-fin is perpendicular; whereas it is really circular, as in this drawing. This fiſh had ſixty-eight ſpines on the mouth-ſide, and eighty-eight on the oppoſite.

eel,

eel, the *Anguilla libera* of Jago (Ray, page 166) which has a milder taſte, and fewer little bones than the conger.

Our launces, or ſand-eels, are extremely good; they lye about ſix inches deep in the ſands when the tide is out, but this ſeems only their place of retirement to wait the next tide; when that tide returns and covers them, they expatiate again in the waters: they are ſometimes taken among the pilchards, as Mr. Jago informs us, Ray, page 165, ib. giving the icon of one fifteen inches and a half long, with one belly-fin, which Mr. Ray's wanted [o]. This fiſh is alſo found in the ſtomachs of porpeſſes, but whether from their rooting them up out of the ſand, as Mr. Ray (Creat. page 140) obſerves, or *nayant*, can ſcarce be determined.

We have a kind of ſea-adder which I find not at preſent well deſcribed: It ſeems a *ſpecies* of the acus, or needle-fiſh, but very different from the ſea-adder (as the Corniſh called it) brought to Mr. Ray [p]; his was like a worm *(Ophidion lumbriciforme)*, no more than five inches and a half long, of the bigneſs of a gooſe-quill, ending in a ſharp finleſs point: this was ſixteen inches and one eighth long, had a back and tail-fin, the proportions as in this figure, Plate XXVI. Fig. XII. the ſcales ſhaped like thoſe of a land-adder: its paunch being opened, ſome hundreds of young fry (like little eels) put into water, ſoon moved to and fro [q]; it had a ſemicircular *ſulcus* on the back.

Plate XXVI. Fig. VI. is the ſun-fiſh taken at Penzance in May 1743 [r]. It was three inches thick at the back, at the belly only three quarters of an inch; the tail cartilaginous, pellucid; the colour dapple, ſpotted darker on the back; the belly ſilver, pearl-coloured, with ſtreaks or fillets half an inch wide, conſiſting of two liſts of dark, between which the middle liſt was pearl ſpotted with black: theſe ſtreaks begin under the eye, and continue at equal diſtances to the pectoral-fin; ſmooth without ſcales. This fiſh was but ſmall, as may be obſerved by the ſcale annexed; but they are ſometimes extremely larger. In the year 1734 [s], there was one taken at Plymouth of above five hundred pounds weight; and in Ireland they are ſometimes taken twenty-five feet long, and proportionably thick [t]. There is a ſhorter ſort of this fiſh (Willughby, Tab. I. page 29) which is deſcribed by Ray, (Synopſ. page 51) who met with it at Penzance: I have added the icon of it from Jago, adapted to the general ſcale, Plate XXVI. Fig. VI. It is the *Orthragoriſcos ſive Luna Rondeletii*, page 424, the *Mola Salviani & Raii*, page 51, and the *Oſtracion quartus* of Artedi, page 83. This fiſh

[o] See ibid. page 38.
[p] Ibid. page 47.
[q] Qu. an Acus 2da ſpecies Rondel. Willughby, Tab. I. 25, Fig. VI.
[r] This is the Oſtracion oblongus, glaber, capite longo, corpore figuris variis ornato of Artedi, N°. 23, page 86.
[s] Philoſ. Tranſ. 1742.
[t] Hiſt. of Waterford, page 271.

is

is called by Ray and others the ſun-fiſh, as being round, and emitting a kind of ſplendour in a dark room; by others (with Rondeletius) the moon-fiſh, becauſe not only round and ſhining by night, but having the ſhape of the creſcent (ſee Plate XXVI. Fig. VII. page 263, *a)* betwixt its little pectoral fin and eye; but what is more remarkable in this creature is, that ſo large a fiſh ſhould have ſuch little fins, and thoſe moſtly at its hinder parts: this fiſh is one conſpicuous inſtance how artfully nature adapts the inſtruments of motion to the form of the body which is to be moved; it is ſo thin, long, and flexile, that a large fin in the former part would hinder its ſwiftneſs; being itſelf but one thicker fin, it wafts itſelf forward in a great meaſure by the meer bending of its back from ſide to ſide, whilſt its wedge-like form, and ſharp-pointed head, eaſily cut their way; but the chief momentum is from behind, where the tail-fin, *b b*, is fixed as a rudder and an oar too, reaching from top to bottom, to keep the whole body on its edge the more ſteadily, as well as further and guide its progreſs: at each end of this ſingular appendix is a fin, the upper one, *c*, raiſing itſelf above the body, and the under one, *d*, tending below it, both by their ſpread encreaſing the force in theſe parts, co-operating with the wavy flexures of the body, and accelerating its progreſs in the ſame manner as an oar working at the ſtern of a boat, drives forward and directs the whole machine.

SECT. VI. Fiſh, ſpinous, bony, &c.

Of ſpinous or bony-fiſh, the rays of their back ſoft and flexible, (called *Aſelli* from their aſinine colour) we have the cod or keeling, and of that two ſorts, the one whitiſh aſinine, the other ruddy-brown ſpotted with yellow ſpecks; the firſt has the *linea*, or ſide-ſtreak, from the gills to the tail quite white, the other of a browner caſt. The firſt is the *Aſellus major vulgaris*, *Raii*, page 53, *&c.* (*Gadus 4tus Artedi gen. Piſc.* 16, 4), between three and four feet long, a fiſh, for the delicacy and firmneſs of its fleſh, equal to moſt; the other we call commonly the Tamlin Cod, Red or Rock-Cod, about two feet long; the *Aſellus major ſaxatilis ſeu rubens*, Jago, in Ray, page 165.

Beſides others mentioned by Mr. Ray[u], we have the poor or power, *Aſellus mollis minimus* of Jago (Ray, page 163, N. 6) bearded as the *Aſellus major*.

Of two-finned ſpinous *Aſelli* (beſides the uſeful hake and ling), the great forked-beard is to be noted; it is eighteen inches and a half long, *Barbus major Cornubienſis cirris bifurcatis* (Jago, Ray, page 163), and the leſſer forked-beard about five inches long, *Barbus minor Cornubienſis cirris bifurcis*, ibid. Ray, page 154. Theſe

[u] The whiting pollack—Rawlin pollack, bib or blind-hadoc—Whiting. Ray, page 53, 54, 55.

two

two are ſeldom taken on our coaſts, and therefore Mr. Jago reckoned them among the non-deſcript.

Of fiſh of the tunny kind, we have have the tunny, aliàs Spaniſh mackrel, the *Thynnus et Orcynus Autorum:* Mr. Ray ſaw one at Penzance ſeven feet long: It weighs ſometimes one hundred pounds weight: It differs in nothing from the common mackrel, but that it is much larger, and has no ſpots. Ray, page 57.

The mackrel *(ſcomber)* is taken in great plenty on the ſouthern coaſt of Cornwall, and not only of uſe when freſh, but is ſalted and pickled, and kept all the winter to the great relief of the poor. The coloured ſtreaks of this fiſh are juſtly admired when it is dead, but greatly ſuperior in beauty when it is living. When it is firſt caught, its colours are ſtrong and lively; the ſtreaks on the back of a full, dark, blue green, the general ground of a bright willow green; but as the fiſh grows fainter, and nearer its exit, the ſtreaks loſe their ſtrength, grow paler, and the blue goes off: put the fiſh into a pail of ſea-water it will begin to move, and, as the fiſh revives, the colours recover their luſtre; take it out of the water, and the colours fade, and faint away as before. However inexplicable therefore that configuration of parts is to which colours are to be attributed, it is plain, in this caſe, that the height of the colouring is owing to the circulation of the juices in thoſe fine capillary ducts and membranes of which the outward covering is compoſed; as the blood ſtagnates, the maſs ſettles into a ſtate of reſt, incapable of reflecting the rays of light with equal vivacity: But whatever may be the cauſe, the varied, rich, and finiſhed colourings of fiſh are ſtrong inſtances how intent Providence has always been of diverſifying her works, that they may make their way into our admiration through the eye, as well as gratify our taſte. It was perhaps from the beauty of theſe colours that Ovid took the hint of repreſenting the goddeſs of beauty, Venus, (during the general panick into which Typhæus had thrown the gods) as chuſing to conceal herſelf under the form of a fiſh.

SECT. VII.

Among the ſlippery anguilli-form, we have the whiſtle-fiſh, the rock-ling of Jago (Ray, page 164); in Cheſhire, called a Sea-loche; *Muſtela marina vulgaris.* Its icon is publiſhed from Mr. Jago by Ray, page 162; and beſides others mentioned by Mr. Ray (page 73), I found on Careg-killas, in Mount's Bay, a particular kind of ſuck-fiſh, of which, as very different from the common *Remora* of authors, two icons may be ſeen of the natural ſize, Plate XXV. Fig. XXVIII, XXIX; the former ſhews the back, the latter the under and ſucking part: the fiſh is ſmooth, and purple coloured.

Mr. Jago has added to Mr. Ray's Catalogue the ſmooth ſhan, *Cataphractus lævis Cornubienſis*, Ray, page 164. "*Mulgranoco ſeu Bulchardo*

Bulchardo Cornubienſi bene convenit, ſed cirris bifidis differt." *Ibid.* Fig. 10.

Of fiſh bifinned on the back with ſoft and flexile rays, a very rare one was taken in Mount's Bay, January 29, 1756: It is the *Dracunculus*, Rondel. lib. x. chap. xii. The oddneſs of its ſhape, and the beauty of its colour, induced me to give two drawings of it, Plate xxvi. Fig. x. and xi. It is generally reckoned a mediterranean fiſh, in which ſeas Mr. Ray found it; but ſcarce half the ſize of the Corniſh one. It is alſo different from the icon of Rondeletius: its upper mandible projected much beyond the lower; it was ſharp, bony, and bent forwards like the beak of a raven; its eyes large, cloſe together, placed in the upper part of the head; its head large in proportion to the other parts, and ſomewhat compreſſed; the firſt *radius* of the anterior back-fin ſtiff, and reaching backwards as far as the tail; the fin high, wavy, triangular, with four *radius*'s; the belly-fin had the ſame number; it had four pectoral fins, two immediately under, and two poſterior to the gills; they are horizontal at their inſertions, from which one would imagine, that they were uſed in time of danger for flying[w]; the body is round, tapering to a point at the tail, which is a fin of ſeven rays. When it was firſt taken, its colours were rich, yellow, pearl-colour, and blue.

Fig. iii. Plate xxvi. is the *Draco marinus (Rondeletii aliorumque)*, in our ſeas ſcarce; it is badly deſigned in Willughby, who, as well as other authors who have deſcribed this fiſh, has not taken notice of the deep *ſulcus* on the back, in which, as the ingenious Mr. Dyer, who ſent it me 1757, obſerves, this fiſh can conceal the poiſonous ſpines of his dorſal-fins when they are reclined, that he may exert them occaſionally with the greater execution. I have given a drawing of it by the general ſcale.

SECT. VIII. Some fiſh bifinned on the back have the former fin radiated with prickly points, among which the baſſe claims the firſt place; its elegant ſhape and compact ſtructure (equally adapted for ſtrength and agility) inclined me to give its icon from a large well-fed ſpecimen, Plate xxvi. Fig. xix. This is the *Lupus* of moſt authors; the *Perca, ſpecies 7ma. Percarum Artedi*, page 69.

The mullet is generally taken with us in ſmall nets near the ſhore.

Some of theſe fiſh are named *Cuculi* by the Latins, from the ſound of the voice, which reſembles that of the cuckow-bird, by the Engliſh called Gurnards (from their grunting like a ſow, ſays

[w] Mr. Ray, page 87, ſays the fiſh of the cuculine kind ſometimes employ their fins to the uſe of flying, though chiefly deſigned for another purpoſe.

Ray,

Ray (page 87); the voice of ſome is thought to reſemble that of a pipe; it is therefore called in Cornwall a Piper. Of theſe we have the grey gurnard, the tub-fiſh, the red gurnard or rocket, the piper, the ſtreaked gurnard (Jago, Ray, page 165); and that well-coloured fiſh, and excellent meat, the ſurmullet. What is called in London the Horſe mackrel, the Corniſh call Scad, a fiſh meanly accounted of; not ſo the doree (*quaſi Deauratus*, or gilded fiſh, ſays Ray, page 99), the *faber*, *ſive Gallus marinus authorum*. This fiſh is of firm ſubſtance, and much coveted, but rather dry in compariſon of the ſole and turbot [w].

SECT. IX. Of fiſhes not aculeated, ſingle-finned on the back, we have the comber, (Jago, Ray page 163) the herring, and the pilchard; the two laſt generally known; but the great profit of the Pilchard (of which more in the ſequel) is in a manner peculiar to Cornwall, and more particularly from the river of Fawy weſtward. Beſides theſe, we have the ſhad, or mother of herrings, (Ray, page 105) and the ſprat or ſparling, of which two ſorts are obſerved in the Corniſh ſeas, one the offspring of the pilchard, the other of the herring, and eaſily to be diſtinguiſhed; ſome fiſhermen however think the ſprats a diſtinct kind of fiſh from either, the belly of the one being ſmooth, of the other rough [x].

Of the gar-fiſh, or horn-fiſh, there are two ſorts in Cornwall, ſays Mr. Ray, (page 109) one called the Girrock, the other the Skipper, a fiſh which moves its upper jaw; "*Skipper Cornubienſium corruptione vocis ſkopſter roſtro breviore quam Acus vulgaris, forſan Saurus Rondeletii*, lib. 8. chap. 5." Jago, Ray, page 165.

Of fiſhes ſpinous, ſingle-finned on the back, beſides thoſe found here by Mr. Ray, (from page 127, *&c.*) and thoſe communicated by Mr. Jago, and publiſhed in the end of his Synopſis, (from page 163 [y]) we have a fiſh which, in Mr. Jago's papers, I find called the Black-fiſh, and thus deſcribed: "It is ſmooth, with very ſmall thin ſcales, inſomuch, that they will not be taken notice of without cloſe inſpection; fifteen inches long, three quarters of an inch broad beſides the fin; head and noſe like a peal or trout, little mouth, very ſmall teeth, a full and bright eye, only one fin on the back, beginning from the noſe, four inches and three quarters, near ſix inches long, a forked tail, a large double noſtril. Two taken at Loo, May 26, 1721, in the Sean, near the ſhore in ſandy ground with ſmall ore-weed in his pot." As this fiſh appears to

[w] It is common on our coaſts in the pilchard ſeaſon, when you may buy of the largeſt at Penzance generally for about ſix pence each.

[x] See Hiſt. of Cork.

[y] As the ſea-bream, the chad or young-bream, the wraſſe, butter-fiſh, the father laſher, the gold-finny, the cook, the corkling.

me

me very rare, I have given an icon of it Plate XXVI. Fig. VIII. adjuſted to the general ſcale from a drawing of Mr. Jago.

SECT. X. Profit of fiſhing.

It muſt not be imagined that the catalogue of fiſh given here in in this chapter contains all the fiſh which are caught on the coaſt of Cornwall, but rather the moſt uſeful, moſt rare, and of remarkable properties, which have reached the knowledge of the author; it would be a very difficult taſk to make out an exact liſt; "*Immenſa et ſummè admirabilis Dei potentia atque ſolertia in rebus cæleſtibus, iiſque quæ in aere et terra fiunt, maximè vero in mari, in quo tam variæ et ſtupendæ rerum formæ conſpiciuntur ut quærendi & contemplandi nullus unquam futurus ſit finis*[z]". Of the before-mentioned river-fiſh, the ſalmon, trout, and eel have the preference; of the flat ſea-fiſh, the turbot, ſole, and doree; of the long, the launces, and the conger; of the round, the cod; to which the whiting-pollack, whiting and ling are next, tho' in taſte and firmneſs inferior: the mackrel, mullet, and gurnard are well known; but for profit to the common-wealth of this county, the pilchard is deſervedly eſteemed above all. This fiſh comes from the north ſeas in immenſe ſhoals, and in the ſummer months, about the middle of July, reaches the iſlands of Scilly, and the Land's End of Cornwall; not driven by fiſh of the cetaceous kind (as ſome have thought), but ſhifting their ſituation as the ſeaſon prompts, and their food allures them; thus by a tour to the warm ſoutherly coaſts of Britain, they ſtrengthen and prepare themſelves and their young ones to return to the great northern deeps, for the ſake of ſpawning and ſecuring themſelves during the ſtormy ſeaſon. The pilchard continues off and on in the ſouth chanel, principally from Fawy harbour weſtward, and is taken ſometimes in great numbers at Mevagiſſy, in the creeks of Falmouth and Hêlford harbours, in the creeks of St. Kevran, and in Mount's Bay; ſome pilchards are alſo taken in St. Ives Bay in the north chanel. With the taking this fiſh by ſeyne-nets and drift-nets, the curing them with ſalt, preſſing them, (fuming them being for many years laid aſide) and exporting them to foreign markets, the world is ſo well acquainted[a], that I need only ſuggeſt in a ſummary manner the advantage which this fiſh is of to the county of Cornwall: It employs a great number of men on the ſea, training them thereby to naval affairs; employs men, women, and children, at land, in ſalting, preſſing, waſhing, and cleaning, in making boats, nets, ropes, caſks, and all the trades depending on their conſtruction and ſale; the poor is fed with the offals of the captures, the land with the refuſe of the

[z] Rondeletius, part II. chap. XIV.

[a] See Carew's Survey, page 33, &c.

fiſh

fiſh and ſalt, the merchant finds the gains of commiſſion and honeſt commerce, the fiſherman the gains of the fiſh. Ships are often freighted hither with ſalt, and into foreign countries with the fiſh, carrying off at the ſame time part of our tin. The uſual produce of this beneficial article in money, is as follows: By an exact computation of the number of hogſheads exported each year for ten years, from 1747 to 1756 incluſive, from the four ports of Fawy, Falmouth, Penzance, and St. Ives, it appears, that Fawy has exported yearly 1732 hogſheads, Falmouth 14631 hogſheads and two thirds, Penzance and Mount's Bay 12149 hogſheads and one third, St. Ives 1282 hogſheads; in all amounting to 29795 hogſheads: every hogſhead for ten years laſt paſt, together with the bounty allowed for each hogſhead exported, and the oyl made out of each hogſhead, has amounted, one year with another at an average, to the price of one pound thirteen ſhillings and three pence, ſo that the caſh paid for pilchards exported has at a medium annually amounted to the ſum of forty-nine thouſand five hundred and thirty-two pounds ten ſhillings.

SECT. XI. Whether fiſh here.

It is ſtill a matter of diſpute whether fiſhes do hear; many learned men maintain the affirmative; and certain it is, that ſounds are propagated in water. "All cetaceous fiſhes, ſays Artedi, (ibid. page 19) have the auditory paſſages externally apparent, but all other fiſh have none, and therefore ſeem not to hear. All fiſh are terrified indeed at the ſounds of thunder, cannon, and ſuch violent concuſſions of the air, which have a proportionable effect on the water, and the fiſh may become ſenſible of this by the general ſenſe of feeling." But to this let me add, that though the generality of fiſh have no apparent auditory paſſages, yet they may have ſome ſmall ſecret ducts (probably in their gills or mouth) thro' which they receive ſounds, though in no very acute manner. Nature (by which name I always mean the wiſe Diſpoſer of the natural and uſual courſe of things) leſſens, diverſifies, and proportions the organs of this ſenſe of hearing to the occaſions of the animal, and the medium in which ſounds are to move; if that be thin and light as air is, the auditory paſſages may be large; but if denſe and turbulent as water, thoſe paſſes muſt be ſmall and well guarded, or they will be too violently agitated, and ſoon loſe their tone: thus as Mr. Ray (Creat. page 152, edit. 8) obſerves, the amphibious or aquatic quadrupeds, ſuch as the beaver, otter, phoca or ſea-calf, water-rat, and frog, have very ſmall ears or ear-holes ſuited to the frequent occaſions they have to be in the watry element. Again: ſeveral fiſhes have their names from the ſounds which they utter [b], from which I ſhould conclude,

[b] As the gurnard, &c. from grunting, the cuckow, &c.

that the power of emitting ſounds would not be given them, but for ſome uſe, and for what uſe, if they could not be heard and apprehended by fiſh of the ſame ſpecies? It is aſſerted however by ſome moderns that fiſh do not hear (Philoſ. Tranſactions for 1748, N°. 486); and ſo far the experiments mentioned there ſeem to prove, that fiſh are not perceptible of articulate ſounds; and indeed it cannot be thought that their organs of hearing, formed for ſo thick a medium, need be ſo quick and delicate as thoſe of creatures which live in the air; I think it therefore moſt reaſonable to conclude that fiſh may, and likely do hear as much as is neceſſary for ſelf-preſervation, and that intercourſe which is requiſite to aſſemble and connect individuals of the ſame *ſpecies*.

SECT. XII. Of ſhell-fiſh.

Beſides the muſcle, limpet, cockle, wrinkle, and crabs of all kinds, for better nouriſhment we have the long-oyſter (the *Locuſta marina Aldrovand. de Cruſtat.* chap. 2, tab. 2), and the lobſter, or *Aſtacus verus*, much ſuperior in delicacy of food to the former, and in ſuch plenty on the coaſts of Cornwall, that Well-boats come to load, and carry them alive to London and elſewhere [c].

Of the ſhrimp kind, great quantities are taken in Helford harbour, Mount's Bay, *&c.* in calm weather. Here we often find the hermit-ſhrimp, bernard, or *cancellus*, remarkable for taking poſſeſſion of ſome empty ſhell, and there fixing his habitation as firmly as if it were his own native place; when it marches, it draws the ſhell after it; in danger retires wholly into it, and guards the mouth with one of its forcipated claws [d]. That fine ſhrimp, *Squilla lata Rondeletii*, (lib. 18, chap. 6) *rubra*, *albo maculata*, I found on Careg-killas in Mount's Bay.

Of oyſters there is great plenty in Cornwall; the beſt I have heard of come from the creeks in Conſtantine pariſh on the river Hêl in Kerrier hundred; they have them alſo in all the navigable rivers on the ſouth coaſt, always beſt taſted where there is leaſt communication with the waters which come from mines, ſtamping-mills, and other places infected with mundic and vitriol. This fiſh has the power of cloſing the two parts of its ſhell with prodigious force by means of a ſtrong muſcle at the hinge, and Mr. Carew, (p. 31) with his wonted pleaſantry, tells us of one whoſe ſhell being opened as uſual at the time of flood (when theſe fiſhes it ſeems participate and enjoy the returning tide), three mice eagerly attempted to ſeize it, and the oyſter claſping faſt its ſhell killed them all. It not only ſhuts its two valves with great ſtrength, but

[c] In the ſpring and ſummer ſeaſon the largeſt are bought for four pence each, ſometimes leſs, in Mount's Bay.

[d] Some have erroneouſly imagined that this was a young lobſter.

keeps

keeps them ſhut with equal force, and (as I have been informed by a clergyman of great veracity, who had the account from a creditable eye-witneſs to the fact) its enemies have a ſkill imparted to them to counteract this great force. As he was fiſhing one day, a fiſherman obſerved a lobſter to attempt an oyſter ſeveral times, but as ſoon as the lobſter approached, the oyſter ſhut his ſhell; at length the lobſter, having waited with great attention till the oyſter opened again, made a ſhift to throw a ſtone between the gaping ſhells, ſprung upon its prey, and devoured it. The polity of ſea-animals is it ſeems a ſtate of nature, a continual war, where the fiſh in their ſeveral ranks have as many various arts of oppreſſing and devouring their inferiors, as of ſecuring and defending themſelves from their more powerful antagoniſts; all impreſſed by their gracious Maker for their mutual and reſpective preſervation. We find not the ſame univerſal enmity between the greater and leſs of terreſtrial creatures. Some antipathies indeed, ſome few carnivorous birds and beaſts of prey there are by land, but in the ſea the eggs, the ſpawn, the fry, the ſmall, the weak, are in their ſeveral degrees the common and conſtant prey, food, and ſupport of the greater, older, and more powerful. Why then are ſuch different appetites implanted? Why do not the land-animals prey upon one another with equal eagerneſs? Why, there is leſs need of animal-food on the land than on the ſea, becauſe vegetable food is every where at hand on the ſurface of the earth, and the provident care of man can preſerve in one ſeaſon what does not grow but will be equally wanted in another; the marine vegetables are more ſparingly given, in leſs variety, at greater depths, ſubject to the violences of their native element; the medium which fiſh live in is more boyant, and conſequently the life more erratick than that of land-animals; their digeſtion alſo for the generality (from the coldneſs of the medium they live in) is leſs able to bear the toughneſs and harſh ſalts of marine plants; fiſh therefore muſt have other ſupports, and the animal food is diſperſed in every creek and cranny, as the rich and proper nouriſhment of the finny race. This occaſions a vaſt conſumption 'tis true, but the proviſion nature has made is equal to it, the fecundity of fiſh exceeding all conception.

Of the cetaceous kind there are but few fiſh, and their eggs few; in the cartilaginous betwixt fifty and one hundred eggs; but in all oviparous fiſhes (of which claſs moſt fiſh are) the eggs are ſcarce numerable [e], there being found in one cod (it is ſaid [f]) 9,344,000 eggs.

Of ſhells we have great quantities, but rather more *varieties* than *ſorts* on our Corniſh coaſts. The fineſt are generally ſmall, and in our beſt SECT. XIII. Of ſhells.

[e] Artedi de partib. Piſc. page 31.

[f] Nat. Diſpl. 8vo, page 93, vol. I.

beſt, we cannot boaſt of the rich colourings which the ſhells of the Mediterranean and Indian ſhores afford the collections of the curious. Some however we have too rare and beautiful to be paſſed over in ſilence; thoſe moſt worthy of notice, which have fallen in the way of my obſervation, are the following:

Plate XXVIII. Fig. I. Of the univalve kind, we have the blue-rayed limpet, or the oval pellucid limpet, dotted with blue lines lengthways from the vertex to the margin; *Patella minima, lævis, ovata, pellucida cæruleis a quatuor ad novem lineolis elegantiſſimè inſignita.* From Falmouth Harbour and the Land's-End.

II. The radiated beaked limpet with an oval *apex*; *Patella radiata, inflato apice puſtulato & albeſcente.* From Whitſand Bay.

III. Rough-ridged limpet; *Patella ſtriis rugoſis, aſpera, apice acuminato.* Mount's-Bay.

IV. The fool's-cap, of a pale bloſſom-colour, rarely found on the Engliſh ſhores; when taken up with the animal in it, there is a membrane at its margin by which it adheres to the ſubject it chuſes to ſettle on. From the Land's-End and Heyl Mouth. *Patella rugoſa, alba, vertice admodum adunco.*

V. Smooth tooth-ſhell, the caſe of a ſea-worm; *Dentale læve, curvum, album.* Land's-End.

VI. The wavy ſtriated trochus, pearl-coloured; *Trochus acuminatus, crebris ſtriis tranſverſe et undatim diſpoſitis donatus.* Gwythien ſands.

VII. The pearl-coloured, ſtriated, papillaceous top-ſhell; *Trochus planior, creberrimis ſtriis ſplendidis papillaceis donatus. Ibid.*

The *Nautilus* is very rare in Cornwall, and the *Voluta* of the ſpecimen which I have, not three quarters of an inch diameter.

The white ruddy-ſpotted ſnail with a circular mouth; *Cochlea alba, Lunaris, rufeſcens faſciis maculatis diſtincta. Ibid.*

The ſmooth flat-twirled river-ſnail; *Cochlea ſemilunaris, lævis, ſpirâ unâ tantùm maculatâ diſtincta. Ibid.*

VIII. The cornu-ammonis ſnail; *Cochlea cornu-ammonis.*

IX. The high ſtriated white cochlea, or baſtard ventle-trap; *Cochlea alba, ſtriis raris admodum eminentibus exaſperata.* From the Land's-End.

N. B. The famous ventle-trap, ſold lately at London for eighteen guineas, was a ſpecies of this kind but larger, and the parts leſs connected with the body.

X. The yellow canulated whelke with black furrows; *Turbo*[ε] *luteus, ſeptem ſulcis parallelis nigris diſtinctus.* Land's-End.

The ſmall red and white variegated whelke; *Turbo minimus, lævis, variegatus, albo-rubicundus.* Whitſand Bay.

[ε] Or Turben.

The

SHELLS EXPLAIND, *pa. 276.*

pa. 276.

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III

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VII

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XVIII

C

D

XXXI

XXXIII

Viper

XXXIV

Slow worm.

XXXV

Evet or Newt.

To William Oliver of Bath, variety of Cornish Shells & Reptiles  *Cantab: & Oxon: M.D:—F.R.S. this is with great respect inscribd by*

Wm. Borlase.

Small milk-white ſmooth whelke; *Turbo minimus lævis albus. Ibidem.*

The ſmall needle whelke; *Turbo minimus, ſubfuſcus, acûs inſtar acuminatus. Ibid.*

Fig. XI. The purple-marking whelke. From Mount's-Bay and Loo. The juice which marks is in a ſeparate bag, of a yellowiſh green when firſt drawn upon linen, grows a little ruddy afterwards, till it comes to a faint purple; when dry, and the linen waſhed, it is of a good purple, and rather betters by age and frequent waſhing.

XII. The purple, ſpotted Nuns, aliàs courie; *Concha Veneris exigua, purpuraſcens ſtriis minimis tranſverſis, tribus maculis fuſcis dorſo inſperſa.* Heyl-Mouth.

XIII. The ſmalleſt Nuns without ſpots; *Concha Veneris minima nullis maculis inſignita.* Whitſand-Bay.

IV. The larger-ſtriped *Concha Veneris*; *Concha Veneris major (Liſteri Hiſt. Conchyl. lib.* 4, *ſect.* 9, N°. 71) *lævis, lineis luteis, et albis denſè diſtincta, aperturâ longe inæquali. Ibid.*

It is very curious to obſerve how this ſhell-fiſh proceeds to its maturity: it is here in its infancy, but it narrows this wide opening, and gradually buries the *voluta* of its *apex*, as it contracts its aperture, till it arrives at the ſtate of a perfect courie, when it throws all the after-thickning of its ſhelly-increaſe from its ſides round to its back, where the joining of the two teſtaceous *apophyſes* may be plainly perceived [h].

Of the bivalve kind worth notice the following only have occurred:

XV. The quadrangular ſtriated muſcle; *Muſculus,* [*aperturâ fere quadrangulari*] *ſtriatus, faſciis undatis ſubfuſcis depictus: aliàs, Muſculus Matthioli, lib.* 3, N°. 208. From the Land's-End.

XVI. A ſmaller, leſs-diſtinct ſpecimen of D°. very rare in the Engliſh ſeas, uſually reckoned a Mediterranean ſhell.

XVII. The ſmooth foliaceous purple concha; *Concha lævis, vertice foliis quaſi inſignito, ad marginem leviter purpuraſcens.* Whitſand-Bay.

XVIII. The winged ſcallop; *Pectunculus pennatus ſtriis denſè notatus, luteo-purpuraſcens. Ibid.*

XIX. The rough echinated ſcallop; *Pectunculus echinatus,* [*fuſco-purpureus*] *concha echinata Rondeletii, Geſneri & Aldrovandi. Ibid.*

XX. The regularly-marked ſcallop; *Pectunculus lineis albis & luteo-rubicundis ordinatim diſtinctus. Ibid.*

[h] I am obliged to the curious Mr. Joſ. Platt of Oxford for this and other kind communications from his large collection.

Fig. XXI. The purple ſcallop variegated with white circular fillets; *Pectunculus purpuraſcens vittis albis circularibus variegatus. Ibid.*

XXII. The purple ribbed ſcallop; *Pecten altis ſtriis albo-purpureis, tranſversè variegatis inſignis.* Helford Harbour.

XXIII. The light purple *tellina* with horizontal *ſtriæ*, eminent, and parallel to the margin; *Concha in vertice leviter purpuraſcens ſtriis eminentibus margini parallelis diſtincta: Tellina tertia Aldrovandi ut videtur.*

XXIV. The white crooked-bill bivalve of the bernacle; *Concha lævis candidior, triangularis, vertice admodum reflexo et acuminato.* Whitſand-Bay.

XXV. The poliſhed *tellina*; the fillets diſpoſed at different diſtances, but of an equal breadth throughout as to themſelves, with a ſerrated edge; *Tellina vittis albo-luteis & purpuraſcentibus leviter ſtriata, margine ſerrato. Ibid.*

Tellinæ variè radiatæ, faſciatæ, vittatæ, lævigatæ, aſperæ, ſulco-ſtriatæ pulcherrimæ, et Chamæ parvæ (ut plurimùm tamen ad littora Whitſand-Bay) *ſunt frequenter repertæ.*

XXVI. The flat, ſmooth, ſmall ſea-egg; *Ovulum marinum læve, minimum, figuræ compreſſæ*, or, *Echinus marinus minimus: a* the back, *b* the belly. Mount's-Bay.

XXVII. The round and flat ſea-egg; *Echinus marinus rotundus, figuræ compreſſæ, papillis minimis, ſpinis ſpoliatus.* We have them in the Mount's-Bay from 4 - - $\frac{3}{8}$ inches high and five inches diameter, down to one eighth of an inch high, and two eighths of an inch diameter.

XXVIII. The depreſſed cordate ſea-egg; *Echinus marinus depreſsè cordatus.* Mount's-Bay.

XXIX. The narrow-mouthed balanus; *Balanus ore contracto, cinereus.* Mount's-Bay. The elevation XXIX, the plan XXX.

The wide-mouthed balanus; *Balanus ore hiante magnus.*

XXXI. One valve of the pholas taken out of the middle of a ſtone at Karn-Jenny, Mount's-Bay.

XXXII. The wrinkled, notched, and high-beaked concha or cockel; *Concha cinerea denſa, margine dentato, ſtriis rugoſis et e lateribus undoſè tuberculoſis.* Heyl-Mouth. - - - C, D, are the two ſhells of the jaw of the *teredo*, or auger-worm, with which it eats its way into timber and ſtone; they are ſharp, and turned ſcrew-wiſe one over the other for boreing. Found at Heyl-Mouth, 1756, in fir-timber, by the Reverend Mr. Williams of Glamorganſhire.

SECT. XIV. Foſſil-ſhells.

There being ſuch quantities of recent ſhells on the coaſts of Cornwall, it might reaſonably be expected that extraneous and foſſil-

foſſil-ſhells, ſuch as *pectunculi*, *conchites*, *ammonitæ*, and other remains of marine teſtaceous animals ſhould be found in proportionable plenty in ſtones, quarries, and mines; but thoſe[i] who have travelled through Cornwall, have found no ſuch thing: and ſtrange this may ſeem to ſome, if not an unaccountable deficiency; yet in this particular we ſhall not find Cornwall ſingular, nor the ſubject ſufficiently examined. True it is, that foſſil-ſhells are extremely rare in Cornwall, and I have ſometimes thought that the ſhape of our county might have contributed in a great meaſure to deprive us of theſe curioſities; for being a narrow ſlip of land, projecting into the weſtern ocean, the departing waters of the deluge could not retire to their uſual bed without taking away great parts of the upper *ſtrata*, as a modern author has obſerved[k]; to which let us add, that the ſeas to the north and ſouth of Cornwall could not leave the ſurface of our hills without frequent ſtruggles, as we ſee on ridges where two ſeas meet: they muſt have produced, from their own weight and concourſe, ſuch violent agitations as would not leave ſuch light bodies as ſhells, ſeeds, plants, and animal exuviæ to reſt in the diſſolved clays and ſoft ſtones of ſuch a narrow ridge. But I am perſuaded that this is not the reaſon; for in other counties, and indeed foreign regions, where the ſhape of the country is quite different, and does not at all countenance ſuch a theory, we find the ſame want of theſe extraneous foſſils. Firſt, then, let it be obſerved, that theſe marine *exuviæ* are not equally diſperſed in every place; in many diſtricts few or none are found, in many diſtricts again they are found in all parts; the reaſon of which is, that the teſtaceous tribes do ſometimes ſhift, retire, and diſappear from ſome coaſts, and muſt be therefore accumulated in others. The *murex*, ſo famous formerly on the coaſts of Tyre, has been unknown there for many ages. Foſſil-ſhells (ſays Dr. Shaw, page 383) are very rare in the mountains near Sinai; they are ſtill rarer, if Fame ſays true, in many parts of Aſia minor, where a celebrated Botaniſt of our country, notwithſtanding the utmoſt enquiry, could not hear of any in much larger diſtricts than the county of Cornwall. *Nobiliſſimus Sherardus Botanicus aſſeruit quod in orientalibus plagis ab ipſomet nulla ſpreta induſtria in foſſilium diſquiſitione, præter ſuam & aliorum expectationem nullum unquam diluvianum monumentum comperit.*" *Joſ. Monti Bononienſis de monumento diluviano*, page 24. "For as in our mountainous places (continues the ſame author) there are obſerved whole mountains of teſtaceous *exuviæ* ſtretching themſelves in a ſtraight line for many miles together, as Count Marſilli has frequently informed me; ſo

[i] Ray, Lhuyd, Hutchinſon.

[k] Hutchinſ. vol. I. tract 2, page 90.

alſo

alſo 'tis reaſonable to ſuppoſe, that by the rapid waters of the flood, matter was carried to and fro, and depoſited over large tracts of land little or nothing charged with marine bodies." This ſcarcity may be accounted for by very ſatisfactory reaſons: The diſtribution of recent marine bodies is, and always has been unequal. Why then ſhould foſſil-bodies of like kind be diſperſed with greater equality than the recent? Where there was plenty of teſtaceous animals at the time of the flood, there, or near by, plenty of foſſil-ſhells depoſited in clay and ſtone is found; where there was a ſcarcity of recent ſhell-fiſh, there few or none appear incloſed in the ſolids. In ſome places, by a variety of concurring circumſtances, the ſhell-fiſh were, and are ſtill collected and heaped together; other places muſt in proportion have been, and ſtill are left naked and deſtitute. Either there was a deficiency of recent ſhell-fiſh round the ſhores of Cornwall, or there was not: if there was a deficiency of ſhell-fiſh round the ſhores of Cornwall at the time of the deluge, then it is no wonder that none ſhould be found in a foſſil ſtate; if there was not ſuch a deficiency, then ſhell-fiſh muſt have overſpread the hills of Cornwall, as well as elſewhere, in proportion to the product of the neighbouring ſhores; and the reaſon why they do not now appear is next to be enquired into; and may probably be, firſt, becauſe our waters are very ſharp and corroſive, ſubject to much vitriol, as appears by our copper-lodes, in which there is frequently found more or leſs of copper diſſolved and precipitated by vitriol. The waters of tin-lodes and workings are alſo well ſtocked with vitriol. Now waters impregnated with the ſharp ſalts of vitriol, and ſuch a multitude of minerals and metals as Cornwall abounds with, muſt ſoon have diſſolved the ſhells which were depoſited here by the deluge; and I am the more inclined to believe that the corroſive quality of the Corniſh waters may have conſumed thoſe teſtaceous *exuviæ*, becauſe in Cornwall we have various evidences of the flood, but all of that kind and texture which are proofs againſt ſuch fretting waters. In a cliff four miles north of Boſcaſtle, there are ſeveral *ſtrata* of white cryſtalline ſtones, about four inches diameter, inſerted in horizontal rowes like a liſt or chain of ſingle pebbles ſide by ſide, Plate XVII. Fig. IV. *a a:* theſe liſts were fixed in the general *ſtratum* of this country, which is a brown ſlat, and could be ſpread in this manner by no cauſe ſo likely as the general deluge. A little to the ſouth, in the ſame cliff, I obſerved veins of different colours, from the top of the firm rock to the foot of the cliff waſhed by the ſea, not in a perpendicular but angular direction, and yet preſerving a paralleliſm one to another in a zig-zag manner, as repreſented Plate and Fig. ibid. G W; a phænomenon plainly intimating the oſcillatory motion with which the

ſordes,

ſordes, diſſolved by the flood, was agitated in ſome parts before it ſettled and finally concreted: I paſs over the ſhodes and pebbly *ſtrata* of Porthnanvan (as already ſet forth, pages 76 and 150), though equal evidences of the deluge. Again: In other countries, where their waters are plentifully charged with ſuſpended ſpar (uſually termed petrifying waters), the ſhells ſettling in the *ſordes* which the deluge had every where produced, and afterwards deſerted, were either immured in new forming ſtones of lime and marble, or the *nidus*'s they formed were filled with ſtones or ſemimetallick concretions. It could not be ſo (at leaſt ſo frequent) in Cornwall where ſpar is very rare; petrifying waters few or none, and the baſe of our ſtone moſtly *quartz*. There are in other parts ſome figured foſſils in flinty nodules, as echinites, *&c.* but flints are ſo ſcarce in Cornwall, that it has been till now doubted whether there are any native in the county: there are however ſome (ſee page 106), but being broke, I have not as yet found any marine *exuviæ* in them. Again: In chalky *ſtrata* many of the tendereſt ſhells (ſuch as ſpines of the *echinus*'s, *&c.)* are preſerved in great quantity, but in Cornwall we have little or no chalk. When we conſider therefore the mineral impregnation of our waters, and the hard cryſtalline baſis of our Corniſh ſtones, incapable of yielding to the waters of the flood, and the ſcarcity of ſpar and chalk, we ſhall not think it ſtrange, that ſo ſmall a diſtrict as this county ſhould have few extraneous foſſils to boaſt of. But after all, it is very certain that we have ſome marine and extraneous productions incloſed in our Corniſh ſtones, although they did not occur to the learned gentlemen beforementioned during their ſhort viſits to this county. One caſt of a ſhell in mundic, and ſome vermicular remains, may be ſeen Plate XV. page 137, Fig. XIII and XIV, and Plate XVI. page 141, Fig. LIV, LV, and LVI. Some plant-like caſts in the ſame ſemi-metal may be ſeen, ibidem, from Fig. XXIX to Fig. XXXIII. from my own collection, and probably many other ſorts, vegetable as well as teſtaceous, may occur to others among our minerals. The moſt likely places to afford them in ſtone to a diligent enquirer, I take to be the northern coaſt near Lower St. Column and the ſhore of Cuthbert, Carantoc, and Piran ſands, where we have alabaſter, ſtalactites, and the ſand-ſtone, in which laſt I find bits of ſlat: the hart's horn alſo (Plate XXVII. Fig. V.) was extracted, in the year 1752, from the middle of a rock of this Corniſh free-ſtrone, at New-Kaye, in the pariſh of Lower St. Columb, Cornwall, (ſee page 95) which I therefore give in its natural ſize as it was taken out, the letter G marking the inciſion made by the pick-axe of the ſtone-cutter who found it. The ſcrapings became diſſolved in vinegar, which pure hart's-horn, put into the ſame acid, would not do: the horn had loſt its natural

toughneſs, and was become gritty, cutting ſhort like chalk: it was hollow in the middle, the medullary pith being eaten out, and the ſides of the hollow more corroded than the outſide. This intimates that there is ſpar ſuſpended in the waters of our northern coaſt which cemented theſe ſands into ſtone, though indeed in that ſtone I can perceive no ſhells, after examining them minutely in the microſcope. On the ſouthern coaſt it is very probable that Falmouth Harbour (where there is ſuch plenty of coral, a ſubſtance little different from the nature of ſpar) may afford us ſome ſpecimens of foſſil-ſhells; for I have now before me a lump of ſpar ſeven inches long, three inches and a half wide and deep, with limpets, pectuncles, ſea-eggs, whelkes, oyſters, muſcles, cockles, and ſome teſtaceous and coralline fragments mixed throughout in the body of the ſtone; all ſmall, except the muſcles, which were of ſeveral ſizes: this lump was not fixed in any natural rock, but lay as a detached nodule on the ſtrand near the mills betwixt Falmouth town and Pendinas caſtle; it may not therefore carry all the evidence that it would have done if found farther from the ſea, and in a quieſcent *ſtratum*; but it muſt be acknowledged, that it could not come from far by reaſon of the roughneſs of the ſurface; and foraſmuch as it contains no ſhells or fragments but what are common to this harbour, it is moſt likely to have been the product of the neighbouring cliffs. At the Par, near Fawy, there is a lime-ſtone not very unlike the ſubſtance of a coarſe coral; it is much eaten by the Pholades and ſmall worms, with the ſhells of ſeveral pipe-worms affixed, of a ſubſtance very little different from the ſtone itſelf. This ſtone makes a ſtrong efferveſcence with *aqua fortis*; and if there be not much ſpar-ſtone in this neighbourhood, moſt probably theſe worm-eaten ſtones have been imported from other parts for making lime, and being diſperſed in the ſands and ſea, have been ſeized by the pholades of this coaſt.

CHAP. XXIV.

Reptiles.

SECT. I. OF reptiles, we have the adder or viper, uſually about two feet long, of which the icon may be ſeen Pl. XXVIII. Fig. XXXIII. p. 276. Its bite is attended with immediate ſwelling, and dangerous if ſome remedy be not ſoon applied. Sallad-oil, taken internally, as well as externally rubbed on the wound, is reckoned a ſalutary method of proceeding; but the firſt thing to be done, ſays Dr. Mead[1], upon

[1] Of poiſons, page 42.

the

the bite of a viper of any kind, is, that the patient, or ſome one for him, ſhould immediately ſuck the wound, having firſt waſhed his mouth with warm oil, and holding ſome of this in his mouth whilſt the ſuction is performing, to prevent any inflammation of the lips and tongue from the heat of the poiſon, after which the ſaid learned author preſcribes emetics worked off with oil and warm water:" but without theſe precautions (which do not always occur to perſons in haſte, and in torture), it is certainly very dangerous to ſuck the poiſon; Matthiolus gives us an inſtance [m] of a perſon who having his finger bitten by a viper, in the agonies of death put it in his mouth, with the blood ſucked in the poiſon, and died on the ſpot. It may not be amiſs therefore in this place to ſuggeſt a more harmleſs remedy, adminiſtered by a good Lady of my neighbourhood *: ---- A man, falling aſleep after mowing in the garden, had his breaſt ſtung by an adder; waked by the pain of the wound, he ſhook off the adder from his ſhirt, and immediately applied to the Lady of the houſe; ſhe ordered a young pigeon with its *anus* cloſe to the wound to be applied; the pigeon (whoſe reciprocal contraction and dilatation in thoſe parts is well known) ſoon ſwelled, ſickened, and died; a ſecond pigeon was adminiſtered to the place infected in like manner, and kept cloſe to the breaſt for ſome time, till it grew faint, and could draw no more; the man was entirely cured, and the ſecond pigeon was found dead the next morning.

On the northern coaſt of Cornwall, about Stratton, I had a ſnake brought me: It differs from the viper in the weſtern parts of this county in that it is larger, of a browner colour, not ſo ſoon incenſed, nor ſo poiſonous: It is very prolific, and generally lays its eggs in heaps of rotten horſe-dung; out of one heap of which, as I was informed by my hoſt at Kilkhampton, he had ſeen, at the Barton houſe of Lancels near Stratton, three hundred taken out at one time. The ſame perſon ſome years ſince killed one ſnake four feet two inches long, and proportionably thick: my guide alſo from Kilkhampton aſſured me, that he had this year (1757) killed one about four feet long. The country people have remarked two ſorts of them; one ſort has a white garland round its neck, with a ſharp tail like the point of a ruſh; the other ſort has a yellow garland, with a ſhorter and more obtuſe tail. Snake.

In the iſlands of Scilly they have neither adder, ſnake, or any of the ſerpent kind; whether the earth is here too ſalt, for Pliny obſerves, and to him aſſents Dr. Plott (Oxfordſhire, page 191), that brackiſh earth is freer from vermin than any other); or whether the lands

[m] Wolfg. Franzius Animal. Hiſt. page 519.

* Late Mrs. Baſſet of Tehidy.

are

are too cold and barren, ſnakes being bred out of hot, fat mould, and mud, and lurking in low, rich, ſhady grounds[n], under long graſs, of which in theſe little iſlands there is no abundance. It is obſerved by ſome[o], that on one ſide of a river there are many ſerpents in ſummer, but on the other ſide not one; and if they are brought over, they immediately languiſh, and die in a few hours." No wonder then that there are ſnakes in Cornwall and none in Scilly, when their choice of and averſion to particular ſoils is ſo capricious. There are no ſnakes near Badminton in Gloceſterſhire, and the cauſe aſſigned (Plot's Oxford. page 195) is, that it is an open country; it wants that ſhade and ſhelter which they delight in.

We have a kind of viper which we call the Long-cripple: It is the ſlow-worm or deaf-adder of authors, its bite poiſonous, but not near ſo invenomed as that of the viper: however, I am credibly informed, that at Mr. Powis's, in Oxfordſhire, near Reading, a man about ſix years ſince being by this creature bitten in the arm, loſt his life by it. Its icon is given Plate XXVIII. Fig. XXXIV. This is of the pointed-tail kind: there is another ſort common about Loo and in the eaſtern parts of this county, obtuſe at the extremity as if truncated.

Of the lizard kind we have the newt or evet, which, from its four feet, the Corniſh call *padzher pou*[p]. It is generally found in crofts of furze in the ſummer months: it is not venomous, nor with us found generally in or near water. Its icon may be ſeen Plate ibid. Fig. XXXV.

Among the quadruped reptiles we may reckon the ſeal or ſea-calf, vulgarly called in Cornwall the Soyle, in Latin the *Phoca*, or *Vitulus marinus*. It is common in the caves and on ſhores of Cornwall which are leaſt frequented: it is five feet in length, ſometimes ſeven; his head ſomewhat like that of a calf. Its pectoral-fins reſemble the fore-feet of quadrupeds, with five toes connected by a membrane with which, when in danger, it will throw ſtones very plentifully at thoſe who purſue: the tail is horizontal, and ſupplies the want of fins in the hinder parts. This creature is amphibious; it cannot altogether live in the water, but requires ſucceſſive intervals of reſt and reſpiration on the land. The poor people on the northern coaſts of this county, in times of ſcarcity, do ſometimes eat the fleſh, and indeed the fleſh of the ſeal as well as of the porpeſſe in former ages was admitted among the dainties of the moſt luxurious feaſts[q], but in general the ſeals are killed not for their fleſh, but for their laſting, uſeful, and ſpotted ſkins, and

[n] Brit. Bacon. page 73.
[o] Pontopp. part II. page 36.
[p] That is, four feet.
[q] Philoſophical Tranſactions for the years 1751 and 1752, page 17. Leland's Collectanea, volume the ſixth.

the

the oil and fat which their bodies afford. It is ſuppoſed that the fabulous relations of mermaids and mermen might firſt ariſe from obſerving this creature at ſea in an erect human-like poſture; for whether it is delighted with muſic or any loud voice, as Mr. Carew ſays, (page 35) or whether it is to alleviate the toil of ſwimming, it ſhews itſelf almoſt wholly above water frequently, and near the ſhore, ibid. Add to this that the great docility of this creature (little ſhort of that of the human *ſpecies*), and his being ſo eaſily trained to be familiar with and obedient to man [r], may make us with ſome grounds conclude, that this is the creature to which imagination has given the ſhape of half-fiſh half-man, a ſhape no where elſe to be found. The cunning of this creature to free itſelf from its enemy is remarkable, if what is related be true: The ſeals are in great plenty in the Baltic; when the Ruſſes hunt them, they ſurround ſometimes three or four thouſand together, which the ſeals perceiving, pile themſelves up in a heap, by that exceſſive weight ſtriving to break the ice on which they have been ſurprized, and ſo eſcape their enemy [s]. The *manati* of the Indians, or *Vacca marina*, (Ray's Quadrup. page 193) by Artedi (G. Piſc. page 109) called Trichechus, is only a larger ſort of this kind from ten to fifteen feet long, and ſometimes thirty-five feet in length [t].

The turtle is no native of ſuch northern coaſts as this of Cornwall; however there were two caught on our ſhores in the year 1756. That exhibited here, Plate XXVII. Fig. IV. was caught by the *drovers* in their mackrel-nets four leagues ſouth of Pendinas caſtle, and brought to Truro alive July 3, 1756. It had ſeven ſpinous ridges in its ſhell, ſix fins [u], fleſhy, without nails, flat and ſmooth, (not in large ſcales, as Rondeletius's) of a bluiſh colour without, but within (that is, on the under-part) ruddy, fleſh-coloured, ſpeckled with dark ſpots, as was alſo the under-part of its neck. It was adjudged to weigh eight hundred pounds weight. It was ſix feet nine inches from the tip of the noſe to the end of its ſhell, ten feet four inches from the extremities of its fore-fins, extended. Its ſhell is like that of the *Teſtudo Coriacea, ſive Mercurii*, of Rondeletius, page 450. There was another turtle taken at the ſame time by the *drovers* off the Land's End, which weighed ſix hundred and three quarters after it was bled to death.

[r] Of which ſee Philoſophical Tranſactions, ib. page 113.

[s] See Leigh's Lancaſhire, page 131.

[t] Phil. Tranſ. for 1751—2, page 114.

[u] As the fiſhermen informed me, and to me they made the appearance as in the drawing; but the body was ſo heavy, and the boat ſo full, that I could not get the fiſhermen to turn it ſo as I might obſerve it more particularly. N. B. Rondeletius's icon, lib. 16, chap. 4, has but four fins.

CHAP. XXV.

Of Quadrupeds.

SECT. I. Sheep.

THE ſheep of Cornwall in ancient times were remarkably ſmall, and their fleeces ſo coarſe that their wool bare no better title than that of Corniſh hair, and under that name the cloth made of that wool was allowed to be exported without being ſubject to the cuſtomary duty paid for woollen-cloth. When cultivation began to take place, and the cattle to improve in ſize and goodneſs, the Corniſh had the ſame privilege[w] confirmed to them by grant from Edward the Black Prince (firſt Duke of Cornwall after the Norman conqueſt) in conſideration of their paying four ſhillings for every hundred weight of white tin coined; the ſame privilege of exporting cloth of Corniſh manufacture duty-free, was confirmed to them by the twenty-firſt of Elizabeth[x]. At preſent the eaſtern parts of the county finding themſelves under a neceſſity (from the ſcarcity of tin) of applying themſelves to tillage and paſture, from the rivers Alan and Fawy eaſtward have as large and fine-woolled ſheep as any where in England, and the common people waſh, card, and ſpin their own wool, and bring their yarn to markets[y]. In the neighbourhood of St. Columb, in Rôſland, and St. Kevern, their ſheep are large, and bring a great price, but the ſweeteſt mutton is reckoned to be that of the ſmalleſt ſheep, which uſually feed on the commons where the ſands are ſcarce covered with the green-ſod, and the graſs exceedingly ſhort; ſuch are the towens or ſand-hillocks in Piran-ſand, Gwythien, Philac, and Senan-green near the Land's-End, and elſewhere in like ſituations. From theſe ſands come forth ſnails of the turbinated kind, but of different *ſpecies*, and all ſizes from the adult to the ſmalleſt juſt from the egg; theſe ſpread themſelves over the plains early in the morning, and whilſt they are in queſt of their own food among the dews, yield a moſt fatning nouriſhment to the ſheep.

In ſome of the hilly, rocky diſtricts, we have goats, the kids of which fatten in their ſeaſon without trouble, and are brought to market.

SECT. II. Black-cattle.

In coarſe grounds the black-cattle are ſmall, and live moſtly (eſpecially in the ſummer months) upon the heath and furze; but in large tenements where the ſoil is improved, and the owner chuſes to

[w] Which they had before, "from auncientie," ſays Mr. Carew, page 24.

[x] Camden's Annot. page 8.

[y] At Lanceſton, Camelford, &c.

breed

breed them, the Corniſh have as large cattle as elſewhere, and with theſe the markets are well ſupplied, particularly in the larger towns [z].

The calf is ſold generally too ſoon to the butcher to make fine veal, an inconvenience owing to the multitude of inhabitants, and the quick demand there is for the milk and butter of the dam.

To make butter, the cream is not ſkimmed off raw, as it naturally riſes to the ſurface of the milk; but after it has reſted in the veſſel about twelve hours [a], the milk is ſcalded in an earthen pan, over a ſlow gentle fire, till it is as hot as a perſon can well bear his finger in, by which means the cream, ſettling into a wrinkled furrowed pellicle about a line thick, grows hard and *clouted*. This method of managing the milk is peculiar to Cornwall, and ſome parts of Devonſhire; but unleſs much caution and neatneſs be uſed in cleaning the veſſels, and ordering the fire, is very apt to give a ſmoaky, earthy taſte to the butter, ſoon perceived by and diſagreeable to travellers: it muſt be obſerved alſo that the fire does not increaſe the quantity of butter; for by experiment of the ſame quantity of milk drawn at the ſame time from the ſame cows and paſture, the raw cream made ten ounces and three quarters of butter, the ſcalded cream made only nine ounces and a quarter; the raw cream therefore yielded above one ſeventh more of butter than the ſcalded: this way of ſcalding does however ſoften and meliorate the remaining milk by evaporating, as I imagine, the acrimonious parts; the hard cream alſo preſerves the milk from ſouring, of which the Corniſh common people are ſo ſenſible, that they will eat the ſcald-milk readily, but the milk from which the cream has been ſkimmed raw, they will ſcarce taſte.

The black-cattle ſometimes generate very ſoon; a calf before ſhe was twelve months old having produced, in 1752, another calf at Caſtlehornek, in the pariſh of Maddern, and no material inconveniency enſued; ſhe proved a ſizeable cow, and had ſtore of milk, which is the more extraordinary, becauſe ſuch premature conceptions uſually prevent the growth, impairing the alimentary as well as generative paſſages. Dr. Plot gives us inſtances of the like early fecundity both in Oxfordſhire and Staffordſhire.

Cattle have not only their unuſual and early, but ſometimes their monſtrous productions, of which the moſt remarkable, which has reached my notice, was a calf caſt in the tenement of Kalleſtek in Piran-ſand, in the month of May 1751, by a cow of Thomas Hodge: It had two heads, conjoined; four ears, four eyes, four noſtrils, two mouths, and two back-bones on the fore-part, which

[z] Bodman, Helſton, Penzance, &c.

[a] Some keep it two days (in the winter) before they ſcald it, in order to have the more cream.

came

came into one about two thirds of the back, thence continued as one to the tail; one tail, four legs; it had two hearts, two livers, and all the inwards double, except the *primæ viæ*, from the ſtomach downwards, which were ſingle. It lived four hours, and cried and lowed with two voices at the ſame time. Its figure may be ſeen Plate XXIV. Fig. XVII.

Other anomalous productions this *ſpecies* of animals might afford us; but as Nature pleaſes moſt when ſhe ſticks to her own rules and proportions, her few accidental deviations, deformities, and monſtrous births, have their ſufficient and perhaps intended uſe, if they awaken our gratitude, and make us more attentive to her cuſtomary and almoſt uninterrupted ſymmetry and gracefulneſs.

SECT. III. Horſes.

The Corniſh horſes in general, though of no great riſing, are remarkably ſtrong-limbed; and as our highways are for the moſt-part rough, hard, and ſtony, much more ſerviceable and ſure-footed than thoſe more-ſightly ones which are brought from the eaſtern counties: Formerly they were ſo ſmall in ſtature, that they were ſeized upon as unſtatutable; for, by the ſtatute of the 12th of Henry VIII. every man might ſeize upon horſes depaſturing commons, if they were under a certain ſize [b]. They are at preſent rather ſmall, or but middle ſized, eſpecially in the coarſer and more hilly grounds; but they are ſo much more hardy than others, that they bring a large price, and a ſtrong, punch, and ſpirited horſe, is with us generally called a Gunhilly, from a wild downs of that name (ſtretching almoſt from Helſton to the Lizherd Point) anciently famous for ſuch little horſes.

SECT. IV. Deer.

In this county formerly there was ſuch plenty of Deer, that beſides thoſe of private gentlemen, the Duke of Cornwall had one chace or foreſt, and nine parks*. Henry VIII. diſparked four of them at once, *viz.* Cary-bullock, Liſkerd, Reſtormel, and Lanteglos, near Camelford [c]; and at preſent the Duke has no deer-park. The preſent parks are thoſe of Godolphin, belonging to the Earl of Godolphin; Tregothnan, to Lord Viſcount Falmouth; Lanhidroc and Pinchley, both to Mrs. Hunt; Boconek, to Tho. Pitt, Eſq; Caryhayz, to William Trevanion, Eſq; Pencarrow, to J. Moleſworth, Eſq; Trevetho, to Humphry Mackworth Praed, Eſq; Place, to Humphry Prideaux, Eſq; Tehidy, to Francis Baſſet, Eſq. A great part of Werington Park (ſeat of Humphry Morice, Eſq;) is alſo in Cornwall.

Red deer are ſeldom ſeen in this county; ſome however make their appearance for a time on the hilly downs about Bodman,

[b] Car. page 24.

* Doderidge, p. 118, of the Dutchy of Cornwall.

[c] Formerly belonging to the ancient manor of Helſton (alias Helleſbury) there.

whence

whence they haunt the woods upon the moors [d]: they are found in greater plenty in the north betwixt Lanceſton and Stratton, as if they were apprehenſive of wanting room to range if they advanced into the narrow weſtern parts.

SECT. V.

Of badgers, otters, hares, foxes, rabbits, and other wild inferior quadrupeds, Cornwall has its ſhare, but nothing particular: I ſhall only obſerve, that they will get rid of their wildneſs by time and gentle uſage, of which tame foxes which have been trained up like ſpaniels to attend their maſter, and rabbits uſed to chambers, frequently convince us; but the moſt remarkable inſtance I have met with of the force of cuſtom in this point, is that of a hare, which had not only ſhook off its wildneſs, but the fearfulneſs ſo natural to, and almoſt inſeparable from this creature: It was ſo familiar, that it took bread out of my hand the firſt time I ſaw it [e]; it lay down under a chair in the parlour, and was in all reſpects as gentle, free, and eaſy as a lap-dog: It went out into the garden now and then, and after regaling itſelf with the herbage, returned into the houſe as its proper habitation. The maſter † had an old ſpaniel and a greyhound, both ſo fond of hare-hunting that they would by concert go out together frequently upon the ſcent, and had been obſerved to kill many hares without the direction of huntſman or other aſſiſtance; the greyhound in particular was once diſcovered by a neighbour following his maſter (who knew nothing of it) with a hare in his mouth; with theſe two dogs, ſo fond of their uſual prey at other times, the tame hare ſpent his evenings by the ſame fire, and frequently reſted in their boſom.

It is ſaid [f], that even a Norway bear has for many years been known to follow the herds of cattle like a centinel, and to ſtand tamely by, as the maid was milking, and that he always drove the wolf away. The ſame author informs us, that the otter may be made tame, and uſed to a houſe, by being fed with milk, and become in time a daily fiſher for his maſter, go out on command, and bring in one fiſh after another into the kitchen *.

SECT. VI.

The properties and uſe of quadrupeds.

Other properties of brutes are ſtill more worthy of our notice. Firſt, The great variety of ſhape and colour obſervable in the quadrupeds prevents any two from being exactly alike, as much as the human features diſtinguiſh mankind one from another. Wherefore then was this variety beſtowed upon brutes? Are they at all ſenſible of ſuch diverſity? Are they the more happy, or more uſeful to one

[d] Leland mentions them, vol. VII. page 117, about Doſmery Pool.

[e] Auguſt 20, 1738, at Illogan parſonage.

† The Rev[d]. Mr. Newcomb, Rector of Illogan.

[f] Pontopp. part II. page 14.

* Ibid. page 27.

another for it? No. This variety then is doubtleſs intended for the ſake of man, to prevent confuſion, and decide and aſcertain his property. As our next following ſubject therefore is man, it may not be amiſs here to recollect the connexion and dependance which all the brute creation have upon him, and obſerve, that they are formed and adapted both by the properties of their bodies and mind to promote the labours, the food, the cloathing, the paſtime, the ſafety, and delight of man: A great number of them cannot ſubſiſt in the winter, in ſtorms and inundations, without the provident care of man; their reſpective excellencies, like metals in the mine, are of no benefit to the world, unleſs they are conducted and applied by man; they are of little uſe or pleaſure to one the other, or to themſelves, but for food and increaſe, of which the more greedy they are, they are but the more conducive to the advantage of man. I would not be thought to intimate, that they are meer machines, or that the only intent of their creation was to be ſubſervient to man: God deſigned them no doubt to diſplay his glory, and to be happy in their degree, and it is cruelty in man to give them pain wantonly, to impoſe labour without meaſure, and with-hold food and ſhelter from them without compaſſion; but their ſeveral properties plainly ſhew that they were deſigned to fill up the vacancies, if I may ſay ſo, of human nature. If man had the ſtrength of an elephant or an ox, or ſwiftneſs of a horſe, man muſt have had the limbs and ſhape too, the ſame bones and muſcles. How much better is it now ordained? Man has not that ſtrength and ſwiftneſs in his own perſon, but he knows where to find it, and when and whither to direct it: he has that reaſon which gives him the command not only of his own excellently conſtituted body, but of the ſuperior ſtrength and ſwiftneſs for which other bodies are better prepared, though infinitely ſhort of the endowments of the human body. How orderly and proportioned to the neceſſities of human nature do the brutes come in, all in their turn, to ſupply what man wants; ſome by their ſtrength and vigour[g] aſſiſt him in works neceſſary or ornamental, yet beyond the reach of human force without ſuch aids; ſome, by their ſwiftneſs as well as ſtrength[h], transfer him from place to place for the ſake of buſineſs, or pleaſure, or devotion; thoſe remarkable for extraordinary fierceneſs[i] as well as ſtrength (that they may not annoy and impede him in his deſigns), like noxious, poiſonous herbs, are ſcarce, and far removed into ſpacious and ſcarce habitable deſerts; there they have their uſe, feeding where, and on what other creatures will not, clearing the air of the infectious ſteam of carcaſſes, and leaſt they ſhould mul-

[g] The horſe, the ox, the aſs, the camel.
[h] The horſe, the dromedary, rain-deer, &c.
[i] Lion, panther, leopard, &c.

tiply

tiply too faſt for the ſafety of other animals, inciting the hunter by their precious ſkins, and by their mutual furiouſneſs and continual war deſtroying one another. Again: Thoſe remarkable for ſwiftneſs without ſtrength [k], frequent thickets, holes, and wilds, where they may excite the purſuit, and promote the health and activity of the purſuer; even the moſt inconſiderable [l] are intended to awaken our diligence, and teach us attention, neatneſs, and patience. Thoſe which neither are game, nor docile and domeſtic [m], afford ſkins and furs for cloathing; what are bred to paſture [n], afford us food and cloathing, and labour too; every one, but in a different manner, ſupplies ſome want or conveniency of man, faſhioned and formed thereto as ſervants trained up and determined to their reſpective occupations: but their faculties of mind are no leſs proportioned to this ſtate of ſubjection, than the ſhape and properties of their bodies; they have knowledge peculiar to their ſeveral ſpheres, and ſufficient for the under-part they are to act. If they had more or leſs, they would be of leſs or no ſervice to man; they have inſtinct to feed themſelves, to continue their *ſpecies*, to facilitate and reconcile themſelves to their labour and reſt, to apply their ſtrength and agility, and this is enough; if they had reaſon, if they had a higher degree of knowledge, and could compare their ideas, ſelect and reſume by memory, and make deductions from what is paſt, as well as foreſee and anticipate what is to follow, they would be the plagues of mankind; they would repine, reſent, reveal, combine, rebell, and neither their ſtrength nor ſwiftneſs, neither their fleſh for food, nor their ſkins and fleeces for cloathing, would be at our diſpoſal; their bodily powers enabling them to be maſters, they would no longer endure their preſent neceſſary and much happier ſtate of ſubordination.

From brutes therefore, we are directly lead to their lord and maſter, Man.

CHAP. XXVI.

Of the Inhabitants; their Number, uſual Age, Cuſtoms, Paſtimes, Feſtivals, Manners good and bad, Language, Tenures, Arts.

ALTHOUGH the eaſtern part of this county may not exceed any ordinary equal ſpace in other counties ſolely addicted to huſbandry, in the number of inhabitants, yet the weſtern half, where there is tin and fiſh, is extremely populous, and may

[k] Hare, rabbit, fox, &c.
[l] As rats, mice, moles, vermin, and inſects.
[m] Beavers, ſable, ermins, &c.
[n] Sheep, goats, bullocks, &c.

vie

vie in that reſpect with any part of England of the ſame dimenſions, where there is no great town or city.

SECT. I. Health. The inhabitants are uſually of middle ſtature, healthy, ſtrong, and active, mining and fiſhing enabling them to bear watching, cold, and wet, much better than where there are no ſuch occupations: the miners particularly, who eſcape accidents, and live temperately, generally live to a great age; the alternate daily uſe of cold and heat, wet and dry, hardening their bodies equally againſt the different extremes of weather.

SECT. II. Age. Our air, it muſt be allowed, is very ſalt, and its influences upon tender, ſqualid, and neglected habits, proportionably fretting and acrimonious; but to the natives in general it cannot be ſaid to be unhealthy, as many inſtances of long-life occurring in Cornwall perhaps, as in any part of Britain. Mr. Carew (who lived in the reign of Eliz.) obſerves *, that eighty and ninety years of age was ordinary in every place; and among other inſtances of longevity, names one Polzew, who died a little while before his writing, aged one hundred and thirty years. Mr. Scawen, a gentleman of no leſs veracity, in his MS° tells us, that in the year 1676, died a woman in the pariſh of Gwythien (the narroweſt, and therefore, as to the air, to be reckoned among the ſalteſt parts of this county) one hundred and ſixty-four years old, of good memory, and healthful at that age; and at the Lizherd, where (expoſed as this promontory is to more ſea on the eaſt, weſt, and ſouth, than any part of Britain) the air muſt be as ſalt as any where, there are three late inſtances of people living to a great age: The firſt is Mr. Cole, late miniſter of Landawidnek, (in which pariſh the Lizherd is) who by the pariſh regiſter, A. D. 1683, appears to have been above one hundred and twenty years old[p] when he died[q]. Michael George, late ſexton of the ſame pariſh, buried the twentieth of March, ibid. was more than a hundred years old; and being at the Lizherd with the Rev[d]. and worthy Dr. Lyttelton, Dean of Exeter, in the year 1752, we went to ſee a venerable old man called Collins; he was then one hundred and five years old, of a florid countenance, ſtood near his door leaning on his ſtaff, talked ſenſibly, was weary of life he ſaid, and adviſed us never to wiſh for old-age. He died in the year 1754.

* Page 61.

° Pen. Car. Lyttelton, L L. D. Dean of Exon.

[p] "Was aged above one hundred and twenty years by far." Regiſt. ibid.

[q] Of this Mr. Thomas Cole, I find the follow-lowing memorandum written in my Hakewells Apology, page 166, ſigned J. M. (viz. James Millet, late Vicar of St. Juſt): "Thomas Cole, Miniſter of and at the Lizard, went one morn on foot from Lizard to Penryn, whtch is at leaſt thirteen miles, and returned again the ſame day on foote to Liz[d], at which time he was at leaſt one hundred and twenty years, and was met going and coming by Mr. Richard Eriſey of Eriſey, as credible authors report."

Some

SECT. III. Strength.

Some inſtances of the ſtrength, and activity of body among the Corniſh, Mr. Carew has given us (page 63), to which I refer; but one inſtance of the ſtrength of the human *thorax* I have met with, too remarkable to be paſſed by in ſilence: Tueſday, March 22, 1757, between twelve at noon and one o'clock, John Chilew of the pariſh of Ludgvan, carrier, aged forty-one years, walking by the ſide of his wain, by accident fell on his back in the way of the wheel, and before he could extricate himſelf, the wheel took on upon his left ſhoulder, broke his collar-bone, and went off juſt below his right arm-hole: the wheels were about three inches and a half wide, ſhod with iron plates, and nails proportionably. The whole weight of the wain may be moderately computed at ſix hundred pounds weight: in the wain were four blocks of tin of three hundred and ten pounds each, a caſk of brandy two hundred and fifty pounds, ſome baſkets with trifling weights reckon twenty pounds: the floor of the road on which he lay was level, ſo that his breaſt had the full preſſure of one half at leaſt of two thouſand one hundred and ten pounds during the paſſage of the wheel. On Friday, April 1, he was well enough to come on foot to church half a mile from his own houſe, complained only of his breaſt being ſore, which he attributed to the buttons of his coat being preſſed inward by the run of the wheel: he has followed his calling ever ſince in the ſame manner as he did before, without any inconveniency.

SECT. IV. Defective birth.

Nature is ſtrong, and more perfectly compacted in ſome ſubjects than in others; but it is rare that ſhe is at all defective in any: ſome inſtances however there are, in which the human frame is but half formed, and that diſtorted. "On the firſt of June, A. D. 1634, the wife of one Richard Lower, dwelling at Hunt's-barne within the pariſh of St. German's, was in the night delivered of a double birth; the one a perfect male child, the other ſeemed to be of the ſame form and ſex, wanting a head, but the neck thereof ſeemed to advance itſelf ſomewhat above the ſhoulders, on the left ſide whereof there grew a lock of hair of ſomewhat leſs than an inch in length; the upper part of the neck ſeemed raw and bloody, but overgrown with a perfect ſkin: it likewiſe wanted the left arm (without any break of the ſkin), and the thumb and little finger of the right hand; the navel ſtood in the midſt of the breaſt, where all the bowels lay, yet the belly thereof perfect; the feet had the heels turning forwards, and the toes backward, and the legs lying acroſs, of which the right had three, the left but two, and thoſe conjoined together with a third; nails likewiſe thereon that grew out of the fleſh [k]."

[k] From a MS of the late learned John Anſtis, Eſq; Garter King at Arms, communicated by the Rev[d]. Dr. Milles, Præcentor of Exeter.

SECT. V. A torpid ſtate of ſeven years.

The powers of the mind, together with the nervous faculties of the body, are ſometimes interrupted and ſuſpended, and then reſtored: the moſt remarkable inſtance of which happened lately in the town of Penzance to Phillis wife of Thomas Sibley, fiſherman, who on the third of Auguſt 1744, aged then about forty-one years, had a male child, was well in health, nurſed the child, and had plenty of milk; but within a few weeks after (*viz.* in September 1744) upon hearing a rumour that her huſband was drowned in Gwavas-lake by the then violent ſtorm, took fright; this ſtruck back her milk immediately, ſhe grew low-ſpirited, gradually weaker, deſpaired of remedy, loſt her memory (but not totally), and ſcarcely diſtinguiſhed one perſon or thing from another: On the ſeventh of May, 1747, ſhe had a dead child, but was ſo weak that ſhe was not ſenſible of her having had a child; and about ſix weeks after being brought to-bed, loſt her memory quite, knew no one, and loſt her mouth ſpeech. She uſed at times milk, broth ,fiſh, and potatoes, as they were adminiſtred, but could make no ſtir to feed herſelf; and in the whole taking little nouriſhment of any kind, was altogether emaciated, and continued without motion, ſpeech, and apprehenſion, till Chriſtmas 1753, when, on a Sunday night, ſhe had ſeveral ſtrong convulſive fits, and the family thought theſe her laſt ſtruggles; but they were only the efforts of Nature to remove obſtructions, and reſtore the ſenſibility of the nervous ſyſtem. The fits returned the next day, and when they had ceaſed, ſhe ſeemed to take a little more notice of things round her than ſhe had done before; then perceivably bettered in ſenſes and diſcernment for about half a year, when, a little before Midſummer 1754, after much ſtruggling, ſhe ſpoke a few words very imperfectly and like a child learning to pronounce, found her tongue very ſtiff, and was ſome days before ſhe could ſpeak diſtinctly, after being ſeven years and two weeks utterly ſpeechleſs. She has the character of a ſerious, good woman; and when I ſaw her, July 27, 1757, inclinable to be corpulent.

SECT. VI. General cuſtoms.

Among ancient cuſtoms ſtill retained by the Corniſh, may be reckoned that of decking their doors and porches on the firſt of May with green boughs of ſycamore and hawthorn, and of planting trees, or rather ſtumps of trees, before their houſes. From towns they make excurſions on May eve into the country, cut down a tall elm, bring it into town with rejoicings, and having fitted a ſtraight taper pole to the end of it, and painted it, erect it in the moſt publick part, and upon holidays and feſtivals dreſs it with garlands of flowers, or enſigns and ſtreamers. Keyſler[1] thinks that

[1] Page 88 of Northern Antiquities.

" this

" this cuſtom took its riſe from the earneſt deſire of the people to ſee their king, who ſeldom appearing at other times, made his proceſſion at this time of the year to the great aſſembly of the ſtates held in the open air; the women and men therefore, drawn by curioſity, paſſed their nights and days, but eſpecially the night before the firſt of May, (allured by the vernal ſeaſon) in dancing and feaſts in the open air and in the woods," in memory of which rural nocturnal aſſemblies, early on the firſt of May every houſe has its bough or branch at the door, as if the maſter was but juſt returned from the woods. This is not improbable, but it is as likely that this cuſtom is nothing more than a gratulation of the ſpring, and had no other foundation than to diſplay the leaves and bloſſoms which begin at this time to adorn every hedge, tree, and ſhrub; of this every houſe was to take notice, and by exhibiting a proper ſignal of the ſpring's approach, to teſtify their univerſal joy at the revival of vegetation.

SECT. VII. Bonfires.

It is a general cuſtom in Cornwall to make bonfires in every village on the eve of St. John Baptiſt's and St. Peter's day, which I have in another place expatiated upon [m], as the remains of part of the Druid ſuperſtition.

SECT. VIII. Plays.

Another general cuſtom was the *PLAY* or interlude in the Corniſh tongue. Of theſe plays the ſubjects were taken from Scripture, and the deſign ſuitably good, even that of inſtructing the common people in the meaning and excellency of the Holy Scriptures [n], although the deſign, it muſt be owned, is executed in a coarſe and rude manner.

" There are two M S S in the Bodleian Library which [o] contain ſome interludes, or, as the author calls them, *Ordinalia:* the firſt in parchment, written in the fifteenth century, exhibits three *Ordinalia*; the firſt treats of the creation of the world, the ſecond of the paſſion of our Lord Jeſus Chriſt, the third of the reſurrection [p]. The other M S is on paper, written by William Jordan, An. 1611. This has only one *ordinale*, of the creation of the world and the deluge [q]. There is a third book written in Corniſh on vellum, which Mr. Ed. Lhuyd (late keeper of the Muſæum at Oxford) received from John Anſtis, Eſq; Garter King at Arms before mentioned.

[m] Antiquities of Cornwall, page 130, 131.

[n] Biſhop Nicholſon's Letter to Dr. Charlett, November 14, A. D. 1700; of which ſee Antiquities of Cornwall, page 196.

[o] Mr. Lhuyd's account of them in a letter to Thomas Tonkin, Eſq; 1707 ----M S Tonkin, page 36.

[p] Bib. Bodl. B. 40, Art. given by James Button, Eſq; of Worceſterſhire, An. 1615.

[q] Mr. Hals in his M S (viz. Deſcr[n]. of Cornwall) ſays, that theſe plays in M S were brought into Oxford A. D. 1450; but this muſt be a miſtake (if he means all), the laſt-mentioned being not written till the beginning of the laſt century.

It

It treats of the *PASSION* in metre, but not in dramatick dialogue, entitled Mount Calvary [r].

The firſt *ordinale* of the creation begins thus (God the Father ſpeaking):

Corniſh.	Engliſhed.
En Tas a Nef ym Gylmyr	The Father of Heaven I the Maker,
Formyer pub tra a vydh gwrys	Former of every thing that ſhall be made,
Onan ha tryon yn gwyr	One, and Three, truly,
En Tas, han Mab, han Spyrys.	The Father, the Son, and the Spirit,
Ha hethyn me a theſyr	Yes—this day it is my will
Dre ou grath dalleth an Bys	Of my eſpecial favour to begin the world.
Y lavaraf, nef, ha Tyr	I have ſaid it—Heaven and Earth
Formyys orthe ou brys.	Be ye formed by my counſel.

This metre is not ill choſen or unmuſical.

The ſcanning to be performed in the following manner:

Ēn Tăs-ā Nĕf-ȳm Gўl-wȳr
Fōrmў-ēr pŭb-trā vўth-gwrȳs, &c.

It is the Trochaic Heptaſyllable, otherwiſe called the Trochaic Diameter Catalectic [s]. It conſiſts of three trochees and a ſemiped. Ariſtophanes was very fond of it at times [t].

In Latin, Horace adopts it,

Nōn ĕbūr nĕque aūrĕūm.

In Engliſh, Shakeſpeare frequently uſes it; and Dryden for his tendereſt numbers:

Softly ſweet in Lydian meaſure,
Soon he ſooth'd his ſoul to pleaſure.

The language ſuits the metre; as the ſubject is ſublime, the compoſition is not unſuitable, as may be ſeen by the above and following ſtanza:

Yn peſwere gwreys perfyth	In the fourth [day] I ſhall make perfect
Then bys ol golowys glan,	For the world all the reſplendent lights,
Haga hynwyn y a vyth	And I will that they be called
An Houl, an Lor, h'an Steryan.	The Sun, the Moon, and the Stars.
Me a ſet a hugh an gueyth	Them will I place on high
Yn creys an Ebron avan,	In the midſt of the firmament above,
An Lor yn nos, Houl yn geyth	That the Moon by night, the Sun by day,
May rollons y golow Splan.	May yield their glowing ſplendour.

The ſtanza conſiſts of eight verſes with alternate rhymes; ſometimes this is changed for a ſtanza of ſix, of which the firſt and ſecond are of one rhyme, the fourth and fifth of another, and the third and ſixth line of a third rhyme; but the heptaſyllable metre continues throughout with few deviations in this piece and all the others.

[r] Mr. Scawen had a copy of this book in 1678, long before Mr. Ed. Lhuyd had his copy from Mr. Anſtis, and gives a literal tranſlation of it. The MS has been mentioned before, and is in the poſſeſſion of the Reverend Dr. Lyttelton, Dean of Exeter.

[s] Upton on Shakeſpeare, book III.

[t] Ibid.

The

The poetry is the leaſt exceptionable part of theſe interludes: A perſon called the *Ordinary* was the chief-manager; every thing was done as he preſcribed, and ſpoken as he prompted [u]. The perſons of the drama are numerous, in this no leſs than fifty-ſix in number; in the 2d, 62; in the 3d, 60; Princes, Patriarchs, Saints, Angels, (good and bad) and even the perſons of the ever-bleſſed Trinity are introduced. Unity of time, action, and place, is not at all attended to; this firſt-mentioned play runs through a ſpace of time from the creation to King Solomon's building the Temple, and incongruouſly ordaining a Biſhop to keep it [w]. It takes in alſo the fabulous legend of the Martyrdom of Maximilla, in which part the actors are a Biſhop, a Croſier-bearer, a Meſſenger, four Tormentors, the Martyr, Gebal, and Amalek. The Biſhop gives to the tormentors for putting the Martyr to death, Behethlan, Boſaneth, and all Chenary [x]. King Solomon ſpeaks the Epilogue; the audience, with a ſtrict charge to appear early on the morrow in order to ſee the *PASSION* acted, is diſmiſſed in theſe words: Drama.

Corniſh.	Engliſhed.
Abarth an Tas,	In the name of the Father,
Menſtroles a' ras	Ye Minſtrels holy,
Pebourgh whare,	Tune your pipes,
Hag ens pub dre.	And let every one go to his home.

This may ſerve to give a general notion of theſe interludes, which were all tranſlated into Engliſh by the late Mr. John Keigwyn of Mouſehole, at the deſire of the late Right Reverend Sir Jonathan Trelawney, Baronet, Biſhop of Wincheſter, in a literal manner, for the better underſtanding the language, tho' to the diſadvantage of the Poet, and his language too. The beſt compoſition now extant in the Corniſh tongue, is that called Mount Calvary, which is not dramatic, but narrative, and more ſolemn; the incidents (with few exceptions) are all taken from the Goſpel Hiſtory of the Paſſion, and the circumſtances of diſtreſs and ſuffering very affecting. It was firſt turned into metre (as I imagine [y]) by the before-mentioned Mr. Keigwyn at the inſtance of Mr. Scawen of Molinek before-mentioned; but Mr. Scawen diſliking that tranſlation, has placed a literal one in the Lyttelton copy. But to return to the interludes: The places where they were acted were the *Rounds*, a kind of amphitheater, with benches either of ſtone or turf. Of the former ſort that exhibited in the Antiquities of Cornwall (page 196, Plate XVI. Fig. 1.) ſerved this purpoſe; but a much larger one, of higher

[u] Car. page 72.

[w] The wages he gives to the mechanics for their labour is all the field of Behethlen, all Penryn-wood, Enys, and Arwinek, Tregeuler, and Kegyllek.

[x] Places in Cornwall.

[y] See Scawen's own account in Tonkin's MS, page 96.

mound, foſſed on the outſide, and very regular is the amphitheater in the pariſh of Piran-ſand, which, as it has ſome peculiarities, I have here planned, Pl. XXIX. Fig. III. with the following references:

Piran-round. A, the area of the amphitheater, perfectly level, about one hundred and thirty feet diameter; B, the benches, ſeven in number of turf, riſing eight feet from the area; C, the top of the rampart, ſeven feet wide; D, the outer ſlope of the rampart; E, the foſs; F, the ſlope of the foſs; G, the level of the hill on which the work is formed; H, a circular pit, in diameter thirteen feet, deep three feet, the ſides ſloping, and half way down a bench of turf, ſo formed as to reduce the area of the bottom to an ellipſis; I, a ſhallow trench, running from the pit H nearly eaſt, four feet ſix inches wide, and one foot deep, till it reaches the undermoſt bench of the amphitheater A, where it is terminated by a ſemi-oval cavity K, eleven feet from north to ſouth, and nine feet from eaſt to weſt, which makes a breach in the benches.

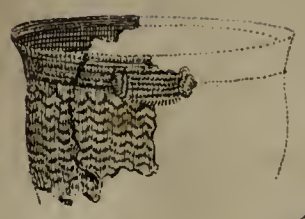
Fig. IV. ſhews the profile of the whole work; *a a*, the area; *b*, benches; *c*, rampart; *e*, the foſs; *h*, the pit; *i*, the trench; *k*, the cavity.

This is a curious and regular work, and is formed with the exactneſs of a fortification, but the viſible benches within, the pit, the trench, and cavity, and the foſs having no eſplanade beyond it, determine it in its preſent figure to the uſes of an amphitheater. The greateſt difficulty is to account for the pit H, and the trench and cavity I K, which are appendixes to it. Now it muſt be obſerved, that the ſcenary part of theſe performances was much worſe than the compoſition; that the ſubject being taken from Scripture-Hiſtory, the perſons of the Deity brought upon the ſtage from above, and the infernal ſpirits from below, they thought it neceſſary to appropriate peculiar places to actors of ſuch different characters; accordingly I find by their interludes that they had a place in their *Rounds* which they called Heaven, and I infer from thence that they had another called Hell; and from theſe two places the different beings were to proceed when they came to act, and withdraw to, when their parts were finiſhed: I conjecture therefore, that as K might repreſent the upper regions, ſo the pit H might be allotted to the infernal. In the interlude of the reſurrection alſo, the pit H might ſerve for the grave; the trench, and the cavity might be deſigned to exhibit the aſcenſion into Heaven. How proper theſe wild expedients were to raiſe the admiration, affections, and piety of the beholders, the judicious reader will eaſily gueſs, and lament the age of ignorance, when by mutual conſent of Laity and Clergy, (for without both they could not take place) the people were to have every truth ſet before their eyes by memo-

rials,

PL XXIX.

I



pl. 298.

II

1 2 3 4 5 6

Scale of inches for I & II

G F E D C B A III C D E F G

N

S

H I K

Plan of Piran Round.

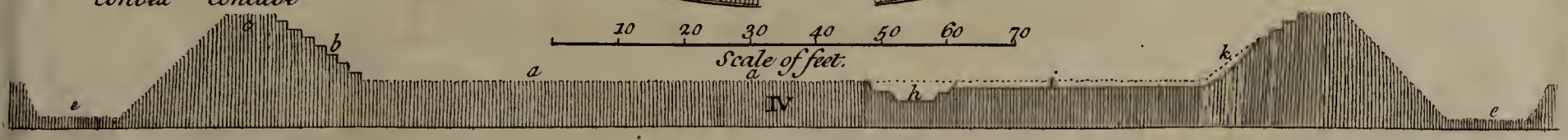
V. wt 20 grns

Convex Concave

VI. wt 19 grns

10 20 30 40 50 60 70

Scale of feet.



VII. wt 20 grns

VIII. wt 22 grns

IX. wt 4 penny wt 11 grns

X

Storm finch or Little Peteril

XI

Sibthorpia Cornubiensis pa: 231.

To Christopher Hawkins

of Trewinard in Cornwall Esq.r
this Plate of Antiquities, the Peteril &c. is with great respect inscribd by

rials, ſcenes, and ſymbols, though the moſt incoherent, unedifying, and abſurd.

Theſe interludes obtained not only in Cornwall (where they were called *Guare-mir*, or Miracle Plays, and the place of acting *plaen an guare* *), but elſewhere, and laſted ſometimes more than one day, and were attended not only by the vulgar, but by people of the higheſt condition, and were remembered, ſays Biſhop Nicholſon [z], by the laſt generation. In the late edition of Stow's Survey, vol. I. page 247, is the following account: "But London for the ſhows upon theatres and comical paſtimes, hath holy plays, repreſentations of miracles which holy confeſſors have wrought, or repreſentations of torments wherein the conſtancy of martyrs appeared." And again: "Theſe or the like exerciſes have been continued till our time, namely, in ſtage-plays, whereof we may read in the year 1394 (ſeventeenth of Richard II.) a play to be played by the pariſh clerks of London at the Skinner's-Well, beſides Smith-Field, which play continued three days together, the King, Queen, and Nobles of the Realm being preſent; and of another played in the year 1409, (tenth of Henry IV.) which laſted eight days, and was of matter from the Creation of the world, whereat was preſent moſt part of the Nobility and Gentry of England [a]." Some faint remains of the ſame cuſtom I have often ſeen in the weſt of Cornwall during the Chriſtmas ſeaſon, when at the family-feaſts of gentlemen, the *Chriſtmas Plays* were admitted, and ſome of the moſt learned among the vulgar (after leave obtained) entered in diſguiſe, and before the gentry, who were properly ſeated, perſonated characters, and carryed on miſerable dialogues on Scripture-ſubjects; when their memory could go no farther, they filled up the reſt of the entertainment with more puerile repreſentations, the combats of puppets, the final victory of the hero of the drama, and death of his antagoniſt.

SECT. IX. Wreſtling.

Among the general cuſtoms, we muſt not forget the manly exerciſes of wreſtling and hurling, the former more generally practiſed in this county than in any part of England, the latter peculiar to it. The Corniſh have been remarkable for their expertneſs in Athletary contentions for many ages, as if they inherited the ſkill and ſtrength of their fabulous firſt Duke Corinæus, whoſe fame conſiſts chiefly in the reputation he won by wreſtling with, and overcoming the giant Gogmagog, and that fable perhaps founded five hundred years ſince upon the then acknowledged and univerſal reputation of the people of this county for wreſtling. But to leave fables; what ſhould have implanted this cuſtom in ſuch a corner of

* That is, the plain for plays. [z] Letter, ib. ut ſupra. [a] From Fitz Stephen.

Britain,

Britain, and preſerved it hitherto in its full vigour, when either never affected at all, or with indifference in other parts of the iſland, we cannot ſay; certain it is the Grecians, who traded hither for tin, and hither only, had the higheſt eſteem for this exerciſe. The arts of the *Palæſtra* were chiefly cultivated by the Lacedemonians, and yet Plato himſelf among the Athenians was ſo far from diſapproving the exerciſe, that he recommends it to the practiſe of old as well as young women, and thinks it proper for them oftentimes to wreſtle with men, that thereby they might become more patient of labour, and learn to ſtruggle with the difficulties incident to a warlike ſtate. The ardour for this exerciſe ſo prevailed at laſt, that all Greece devoted their time and inclinations to the *Gymnaſia* and *Palæſtra*, and choſe rather to be accounted the moſt expert wreſtlers, than to be celebrated as the moſt knowing and valiant commanders [b]. Whether the Corniſh borrowed this cuſtom from the Grecians, or whatever elſe was the cauſe, you ſhall hardly any where (as Mr. Carew obſerves, page 76) meet with a party of boys who will not readily entertain you with a ſpecimen of their ſkill in this profeſſion.

SECT. X. Hurling.

Hurling is a trial of ſkill and activity between two parties of twenty, forty, or any indeterminate number; ſometimes betwixt two or more pariſhes, but more uſually, and indeed practiſed in a more friendly manner, betwixt thoſe of the ſame pariſh; for the better underſtanding which diſtinction, it muſt be premiſed, that betwixt thoſe of the ſame pariſh there is a natural connexion ſuppoſed, from which *(cæteris paribus)* no one member can depart without forfeiting all eſteem. As this unites the inhabitants of a pariſh, each pariſh looks upon itſelf as obliged to contend for its own fame, and oppoſe the pretenſions, and ſuperiority of its neighbours.

It is ſo termed from throwing or *hurling* a ball, which is a round piece of timber, (about three inches diameter) covered with plated ſilver, ſometimes gilt. It has uſually a motto in the Corniſh tongue alluding to the paſtime, as *Guare wheag*, *yw Guare teag*, that is, fair play is good play. Upon catching this ball dexterouſly when it is *dealt*, and carrying it off expeditiouſly notwithſtanding all the oppoſition of the adverſe party, ſucceſs depends. This exerciſe requires force and nimbleneſs of hand, a quick eye, ſwiftneſs of foot, ſkill in wreſtling, ſtrength and breath to perſevere in running, addreſs to deceive and evade the enemy, and judgment to deliver the ball into proper hands, as occaſion ſhall offer: in ſhort, a paſtime that kindles emulation in the youngeſt breaſt, and like this requires ſo general

[b] Alex. ab Alexandro, lib. II. vol. I. page 494.

an

an exertion of all the faculties of the body, cannot but be of great uſe to ſupple, ſtrengthen, and particularly tend to prepare it for all the exerciſes of the camp.

Theſe two cuſtoms of wreſtling and hurling were formerly much more uſed than at preſent, and 'tis great pity that frolicking and drinking immoderately (if what is ſaid be true) at the pariſh feſtivals ſhould take place of ſuch ancient, and (under a few regulations) ſuch laudable and manly recreations. The particular rules and cuſtoms by which theſe two paſtimes are directed, and the different manners in which they are practiſed, cannot be more diſtinctly related than the reader (who deſires to be acquainted with them more minutely) will find in Mr. Carew's Survey of Cornwall (Edit. 1. page 74). There is no ſtated time for hurlings and wreſtlings, but they are generally part of their feſtival entertainments. Every pariſh has its annual feaſt, and at ſuch time (however poor at other times of the year) every one will make a ſhift to entertain his friends and relations on the Sunday; on the Monday and Tueſday all buſineſs is ſuſpended, and the young men aſſemble and hurl or wreſtle, or both, in ſome part of their pariſh of the moſt public reſort.

SECT. XI. Pariſh feaſts.

Theſe feaſts inſtituted in memory of the dedication of their parochial Church, were of great eſteem among the primitive Chriſtians, and originally kept on that Saint's day to whoſe memory the Church was dedicated: the munificence of the founder, and endower of the church, was at the ſame time celebrated, and a particular ſervice compoſed for the occaſion [c]. On the eve of that day there were prayers all night in the Church, and hymns ſung in memory of the Saint, and the dedication made to him. From theſe watchings, the feſtivals were called Wakes, and the name ſtill continues in many parts of England, though the cuſtom whence it aroſe has been long aboliſhed. The inconveniency of obſerving theſe feſtivals on the Saint's day being ſenſibly felt (eſpecially in harveſt time), they were by the ſpecial authority of the Biſhop transferred to the next following Sunday, and this innovation occaſioned the injunction of the twenty-eighth of Henry VIII. that the feaſt of the dedication of churches ſhould be celebrated in all places of this realm on the firſt Sunday in October for ever, and upon no other day. This injunction was complied with in ſome places, but never univerſally admitted, cuſtom in this caſe prevailing againſt Law. Theſe feaſts are much exclaimed againſt by thoſe who diſtinguiſh not, as they ought, between the inſtitution,

[c] See Durandus Rationale Divin. lib. VII. fol. 251, and Dugdale's Warwickſhire.

and the degenerate diſorderly obſervation of it, "and the judges of the aſſize, *Walter* and *Denham*, made an order at Exeter, A. D. 1627, to ſuppreſs all ſuch feaſts: the ſame was done in Somerſetſhire A. D. 1631; but upon Biſhop Laud's complaint, ſays my author [d], the laſt order was reverſed; the Lord Biſhop of that dioceſe [e], with ſeventy-two of the moſt orthodox and able of his Clergy, having certified under their hands, that on theſe feaſt days, which generally fell on Sundays, the ſervice of God was more ſolemnly performed, and the Church much better frequented, both in the forenoon and afternoon, than on any other Sunday in the year; that the people very much deſired the continuance of them, and that the Miniſters did in moſt places do the like for theſe reaſons, *viz.* for preſerving the memorial of the dedication of their ſeveral Churches, for civilizing the people, for compoſing differences by the mediation and meeting of friends, for increaſe of love and unity by theſe feaſts of charity, and for the relief and comfort of the poor."

The tinners hold ſome holidays peculiar to themſelves, particularly the Thurſday, one clear week before Chriſtmas-day, which they call *Jeu-whydn*, or White Thurſday, in commemoration (as conſtant tradition ſays) of black tin being firſt melted in theſe parts and turned into white tin, it being the cuſtom anciently, as it ſeems, to export into other parts the tin-ore unmelted, or carry it to the engroſſer's melting-houſe however diſtant.

The tinners alſo hold St. Piran's day on the fifth of March, ceaſe from all labour, and (in all conſiderable mines) are allowed money to make merry withal in honour of St. Piran, who is recorded to have given them ſome very profitable informations relating to the tin-manufacture.

SECT. XII. Local cuſtoms. Bouſſening.

A very ſingular manner of curing madneſs is that mentioned by Mr. Carew (page 123) in the pariſh of Altarnun in this county. It was the cuſtom to place the diſordered in mind on the brink of a ſquare pool, filled with water which came from St. Nun's well [f]. The patient having no intimation of what was intended, was, by a ſudden blow in the breaſt, tumbled into the pool, where he was toſſed up and down by ſome perſons of ſuperior ſtrength, till being quite debilitated, his fury forſook him; he was then carried to the Church, and certain maſſes ſung over him; if he was not cured at once, the immerſion was repeated. This cuſtom was practiſed probably in ſome other parts of this county as well as at Altarnun; for at the foot of St. Agnes's holy well (a place formerly of great reſort) I

[d] Dugdale's Warwickſhire, laſt Edition, page 682.

[e] Bath and Wells.

[f] Nun or Nunne being the patroneſs Saint, from whoſe altar (famous I conjecture for ſome miracles) this pariſh had its name.

think

think the remains of ſuch a pool are ſtill to be diſcovered, though the ſea has demoliſhed the walls. The Corniſh call this immerſion, *Bouſſening*, from *Beuzi* or *Bidhyzi*, in the Cornu-britiſh and Armoric, ſignifying to dip, or drown. *Belgicè Buyſen* (ſays Lye's Junius in *Bowſe*) *unde Anglicè* Bowſe *potare*, *largiter bibere*. This may ſeem to the generality ſo very impotent a remedy, that people might eaſily be perſuaded to look upon any cure that enſued as the miraculous effect of the holy water, and the interpoſition of St. Nun; but if we recollect that madneſs is no other than a raging fever that interrupts for a while, and diſſipates all congruity betwixt ideas and things, we may ſoon ſatisfy ourſelves, that without any miracle, ſo violent an exerciſe of the body in cold water was no contemptible preſcription, ſomething very like this method in parallel caſes having been approved of and practiſed by the greateſt phyſicians [g].

Among the puniſhments inflicted in Cornwall of old time was that of the cocking-ſtool [h], a ſeat of infamy where ſtrumpets and ſcolds, with bare foot and head, were condemned to abide the deriſion of thoſe that paſſed by, for ſuch time as the bailiffs of manors, which had the privilege of ſuch juriſdiction, did appoint. Cocking-ſtool.

" This juriſdiction was granted, ſays Hals [i], [or rather at an inquiſition declared to belong] to the manor of Cotford Farlo, in the pariſh of St. Wenn, Cornwall, in thoſe words, lately to be ſeen in the records of the Exchequer: "" *Maner. de Cotford-farlo, aliàs Lancorla in St. Wenn-moor, temp. Hen.* 3. *Quia per objurgatrices et meretrices multa mala in Manerio oriuntur, lites, pugne, diffamationes et alie multe inquietationes per earum puteſias* [k]; *igitur utimur de eiſdem quod cum capte fuerint, habeant judicium de Cocking-ſtool, et ibi ſtabunt nudis pedibus, et ſuis crinibus pendentibus diſperſis tanto tempore ut aſpici poſſint ab omnibus per viam tranſeuntibus ſecundum voluntatem Balivorum noſtrorum capitalium.*"'

An ancient annual proceſſion there was formerly at Loſtwythyel which retained ſome traces of the royalties anciently belonging to the little kingdom of Cornwall: It was but of late years diſcontinued, ſays Mr. Carew, (page 138) who there gives us the following account of it: " Upon Little Eaſter Sunday, the freeholders of the town and manor did there aſſemble, amongſt whom one (as it fell to his lot by turn) bravely apparelled, gallantly mounted, with a crown on his head, a ſcepter in his hand, a ſword born before him, and dutifully attended by all the reſt alſo on horſeback, rode thro' the principal ſtreet to the Church; there the Curate in his beſt A proceſſion

[g] See Sir J. Floyer of cold bathing.

[h] Rectius f. Coquine, anciently cockaigne, ſignifying an idle jade, a baſe woman. Hickes in Jun.

[i] M S Hiſtory of Cornwall.

[k] That is, *Putagia*, acts of fornication, Spelm. Gloſſar.

beſeene

beſeene ſolemnly received him at the Church-yard ſtyle, and conducted him to hear Divine Service, after which he repaired with the ſame pomp to a houſe fore-provided for that purpoſe, made a feaſt to his attendance, kept the table's end himſelf, and was ſerved with kneeling, aſſay, and all other rites due to the eſtate of a Prince: with dinner the ceremony ended, and every man returned home again. The cauſe and author out-reach remembrance howbeit theſe circumſtances offer a conjecture that it ſhould betoken the royalties appertaining to the honour of Cornwall."

SECT. XIII. Manners.

As to the manners of the inhabitants, they are generally allowed to be civilized and courteous to ſtrangers, and this is no novel character, but ſtands recorded as anciently as the times of Auguſtus Cæſar, and is attributed by Diod. Siculus [l] to that frequent intercourſe with merchants of foreign countries, which the traffic for their tin could not but occaſion. Τῆς γὰρ Βρεττανικῆς καλὰ τὸ ἀκρωτήριον τὸ καλέμενον Βελέριον οἱ καλοικέντες φιλόξενοί τε διαφερόντως εἰσι, κι διὰ τὴν τῶν ξένων εμπόρων ἐπιμιξίαν ἐξημερώμενοι τὰς αγωγάς. The gentry have the reputation of keeping up hoſpitality in their country, and though ſo remote from Court ſhewed formerly (and it is hoped do ſtill ſhew) ſuch an aptneſs as well as capacity for the buſineſs of the ſtate, that Queen Elizabeth uſed to ſay, "that the Corniſh gentlemen were all born courtiers with a becoming confidence [m]."

Surrounded (almoſt) as they are by the ſea, and reckoning themſelves as it were of another and different nation from the Engliſh, in military expeditions they have generally kept themſelves more unmixed from the reſt of the army they roll with, than the inhabitants of other counties; they therefore held ſome privileges peculiar to themſelves. In Egbert's time they are ſaid to have challenged the honour of leading the van in the day of battle, an honour which Michael Cornubienſis ſays, they enjoyed in the time of King Arthur. In Canute's reign, whether the danger was greater in the rear upon ſome remarkable retreat of his army, or whether the Dane piqued himſelf upon inverting all the Saxon order of battle, we find the Corniſh brought up the rear, which by Joh[s]. Sariſburienſis is attributed to their diſtinguiſhed valour [n]. Humphry Lhuyd in his breviary (page 3) calls them the ſtouteſt of all Britiſh nations, and ſays they were accounted to that time (1568) the moſt valiant in warlike affairs.

The uſual exerciſes of hurling and wreſtling which prevailed formerly (and even in the remembrance of the preſent age) not only among the vulgar, but among the gentry alſo, who promoted thoſe trials of ſtrength and agility, headed their ſeveral parties, dealt the

[l] Lib. IV. page 301, Edit. Hanov. 1604.
[m] See Floyd's Memoirs of the Civil Wars, page 469.
[n] Carew, page 83.

ball,

ball, and rewarded the victors) contributed ſurely from all antiquity to make them active, and boldly face their adverſaries; moreover the occupation of miners hardens the conſtitution (as has been obſerved before), and renders it more patient of thoſe exceſſes to which the life of a ſoldier is ſo frequently expoſed; theſe perhaps were the reaſons why the Corniſh gentlemen and their forces, as well without, as within their own county, won immortal honour by their behaviour in the civil wars during the reign of Charles the firſt: of their bravery and loyalty that King was equally ſenſible, and diſtinguiſhed them from the reſt of his ſubjects by the following letter, which he ordered to be read and preſerved in every Church and Chapel throughout the County.

C. R.

To the Inhabitants of the County of Cornwall.

"WE are ſo highly ſenſible of the extraordinary merit of our county of Cornwall, of their zeal for the defence of our perſon, and the juſt rights of our Crown, in a time when we could contribute ſo little to our own defence or to their aſſiſtance; in a time when not only no reward appeared, but great and probable dangers were threatned to obedience and loyalty; of their great and eminent courage and patience in their indefatigable proſecution of their great work againſt ſo potent an enemy, backed with ſo ſtrong, rich, and populous cities, and ſo plentifully furniſhed and ſupplied with men, arms, money, ammunition, and proviſion of all kinds, and of the wonderful ſucceſs with which it pleaſed Almighty God (though with the loſs of ſome moſt eminent perſons who ſhall never be forgotten by us) to reward their loyalty and patience by many ſtrange victories over their and our enemies, in deſpight of all human probability, and all imaginable diſadvantages, that as we cannot be forgetful of ſo great deſert, ſo we cannot but deſire to publiſh it to all the world, and perpetuate to all time the memory of their merits, and of our acceptance of the ſame; and to that end we do hereby render our royal thanks to that our County in the moſt publick and laſting manner we can deviſe, commanding copies hereof to be printed and publiſhed, and one of them to be read in every Church and Chapel therein, and to be kept for ever as a record in the ſame, that as long as the hiſtory of theſe times, and of this nation ſhall continue, the memory of how much that county hath merited from us, and our crown, may be derived with it to poſterity."

Given at our Camp at Sudely Caſtle,
the 10th of September, 1643.

The whole progreſs of the faithful Corniſh in the King's Service may be ſeen in the Earl of Clarendon's Hiſtory of the Great Rebellion, much to the credit of this county; but of all their actions, the battle at Lanſdown near Bath does them moſt honour. Of their gallantry here Mr. Scawen [o], being himſelf a cavalier, produces not his own, but the evidence of their enemies, that is, of the Parliament-forces: "The enemy themſelves have ſufficiently given teſtimony thereto, looking upon it with admiration, acknowledging it ſuch a ſervice they never ſaw the like: Amongſt others by Sir Ralph Knight, a Cromwellian, I have heard it magnified in more particulars than we ourſelves could think fit to write." In memory of this battle [p], George late L[d]. Lanſdown erected a handſome monument on the field of action, on the north ſide of which is engraved the following deſcription of Sir Bevil Granville, Baronet, of Stow in this county, general of the Corniſh forces, who fell there:

"Conqueſt or death was all his thought, ſo fire
Either o'ercomes or does itſelf expire.
His courage work'd like flames, caſt heat about,
Here, there, on this, on that ſide none gave out,
[q] Nor any pike in that renowned ſtand
But took new force from his inſpiring hand;
Soldier encouraged ſoldier, man urg'd man [r],
And he urg'd all, ſo much example can;
Hurt upon hurt, wound upon wound did call
He was the mark, the butt, the aim of all;
His ſoul this while retir'd from cell to cell,
At laſt flew up from all, and then he fell.
But the devoted ſtand enrag'd the more
From that his fate, ply'd hotter than before,
And proud to fall with him, ſworn not to yield,
Each ſought an honour'd grave, and won the field:
Thus he being fall'n, his action fought anew,
And the dead conquer'd, whilſt the living ſlew." *Cartwright*, 1643.

"Thus ſlain thy valiant [s] anceſtor did lye,
When his one bark [t] a navy did defye,
When now encompaſs'd round the victor ſtood,
And bath'd his pinnace in his conquering blood,

[o] MS, page 28.
[p] Deſcribed particularly in Clarendon.
[q] The poet had certainly in view the celebrated paſſage of Homer. Il. lib. XIII. v. 130.

Φράξαντες δόρυ δουρὶ, σάκος σάκεϊ προθελύμνω
Ἀσπὶς ἀσπίδ' ἔρεισε, κόρυς κόρυν, ἀνέρα δ' ἀνήρ.

[r] Hæret pede pes, denſuſque viro vir. Æn. x. ver. 361.
[s] Sir Richard Granville, Vice-admiral in the reign of Queen Elizabeth againſt the Spaniards.
[t] The Revenge.

Till

Till all the purple current dry'd and ſpent,
He fell, and made the waves his monument.
Where ſhall the next fam'd Granville's aſhes ſtand?
Thy Grandſire fills the ſea, and thou the land. *Martin Lewellyn*, 1643.

I make no apology for inſerting theſe verſes; it is ſufficient that the noble founder of this monument, whoſe poetical abilities will not be diſputed, choſe to inſcribe them on marble rather than any of his own compoſition.

SECT. XIV. Ill manners.

To act impartially, I muſt turn the diſagreeable ſide of my countrymen as well as the honourable to the reader, it being no more my deſign to conceal than to juſtify their failings. The lower ſort of people is reckoned litigious [u]; the truth is, that in mining as well as fiſhing there are very numerous and minute ſub-diviſions of property, every working-tinner, though little or nothing worth, ſhall have oftentimes $\frac{1}{32}$ or $\frac{1}{64}$, and ſometimes a leſs ſhare of the adventure; theſe perſons, if the adventure proves a loſing one, as is frequently the caſe, prove the more unwilling the leſs they are able to pay the coſts incurred. Again: Thoſe little adventures do oftentimes ſhift hands, are bought and ſold, and bought again: this produces wranglings, and frequent application to the law-courts. Again: The number of materials neceſſary to mining and fiſhing, is ſo great, that it entangles the people with a great diverſity of ſellers of ropes, candles, powder, iron, timber, ſalt, flax, hemp, line, and the mechanics who work them up; the more bargains the more diſputes, ſome ill-deſigning perſons being always ready to inflame and exaggerate rather than to appeaſe the numerous diſſentions to which ſuch an intricate commerce is perpetually liable. A ſecond reaſon of litigiouſneſs in Cornwall, is, that we have as many ſorts of law-courts here, as in any part of England. Beſides the Courts of Aſſize and Eccleſiaſtical Courts, there is the Lord Warden's Court, from which there is a farther appeal to the Duke of Cornwall in Council; the Vice-Warden's Court held every month, and the Stannary-Courts held every three weeks for tin-cauſes. Here are alſo Court-leets of the Duke of Cornwall, and other Lords of Manors, for debts and diſputes relating to property. By means of all theſe there is too open and eaſy acceſs to law-contentions for the advantage of private families. Litigiouſneſs is therefore partly the fault of the inhabitants, and in part the reſult of their polity and that multifarious trade to which their mining and fiſhery unavoidably expoſes them; whereas in counties where huſbandry is the chief or ſole employ, buſineſs is in fewer hands, bargains plain and eaſily adjuſted, and the gains not ſo great as to prompt thoſe of a middle rank immediately to go to law.

[u] Car. page 67.

Another

Another and no inconſiderable corruption to which our inhabitants of the lower claſs are ſubject, may in part be attributed to the ſame cauſe (I mean their occupation), but can neither be juſtified by that, or any other plea; that is, ſpending much time and money in publick-houſes, which defrauds the maſter of the labour he pays for, deprives the family of that ſubſiſtence which is their natural right; but above all, prompts the tipler to cheat and overcharge, not to ſay ſteal, in order to pay for the exceſſes he has been guilty of. If theſe extravagancies were only committed by thoſe who had wherewithal to pay for them, the vice of exceſſive drinking would not be altogether ſo ſhameful; but the misfortune is, that the pooreſt working-tinner ſhall be credited by the ale-drawer till his account becomes conſiderable, then perſecuted by bailiffs till he pays coſts as well as ſcores. There is no part of England which has more reaſon to complain of this kind of debauchery than Cornwall, and I have heard it hinted, with ſome ſhew of reaſon, that ſince the preſent laws againſt drinking to exceſs are ineffectual, and the nature of a tinner's employ ſecretes him from his maſter's eye, 'tis great pity that ſome farther reſtraints ſhould not be laid upon the keepers of publick-houſes, and retailers of ſpirituous liquors, who might deſervedly be reſtrained by law from ſuing any man, who had neither freehold or leaſe eſtate, for any ſum exceeding one or two ſhillings, and not be at liberty even to ſue for that but before a juſtice of the peace, or after the ſpace of ſix months from the contraction of the debt. This would prevent the idle from ſpending what they have not; for if they had no credit, the ready-money they get comes in ſeldom, and muſt go in neceſſaries, and conſequently would not be ſufficient for the purpoſes of idleneſs. However that may be, this is certain, that to credit a poor labourer for ſuperfluities, much more for exceſſive drinking, is to encourage and tempt him to neglect and tranſgreſs every ſerious duty of life.

Nor does this low luxury and great evil prevail only in the mining part of the county, but in towns and villages, which ſurely is to be attributed to the preſent too general (but it is to be hoped ſhort-lived) corruption of our boroughs at the electing Members of Parliament. This fatal, infamous traffic begins with intemperance and riot; theſe diſſipate every generous ſentiment of freedom, love of our country, and inclination to induſtry: Venality naturally ſucceeds, and is followed by extravagance and idleneſs; theſe by poverty, and poverty (ſuch is the round!) by abandoning themſelves to intemperance again on the firſt opportunity, and repeating the baſeſt proſtitution of the higheſt privilege. A corruption this both of principle and practice, of patriotiſm and morality, infeſting more counties than one; but ſo much the more to be lamented in Cornwall,

Cornwall, as this County has ſo much a greater number of boroughs than any in Great Britain, and ſends as many almoſt as the kingdom of Scotland itſelf [w]. However, the whole diſgrace of this iniquity cannot reſt upon my Countrymen. It is the much to be lamented vice of the nation, and not confined to the vulgar; the part of the corrupted is indeed moſt ſhameful, (for ſo the world will have it) but that of the corrupter is at leaſt equally guilty and ought to ſhare our deteſtation.

SECT. XV. Why Cornwall ſends ſo many members to parliament.

And now I am engaged in this ſubject, it will not be foreign to the Hiſtory of Cornwall, to enquire into the original of this ſo much envied privilege, of ſending a great number of repreſentatives to the Houſe of Commons, from ſo ſmall a county, and from boroughs moſtly ſo inconſiderable as to trade, inhabitants, and every thing that can entitle places to diſtinction; whilſt ſeveral towns in England, much ſuperior in all reſpects [x], have never been admitted to the ſame honour.

This pre-eminence of our county is not ancient. From the 23d of Edward I. five boroughs only, (viz. Lanceſton, Liſkerd, Truro, Bodman, and Helſton) ſent two members each, and the county two. Loſtwythyel has held the ſame privilege from the 4th of Edward II. and ſent two members once before, viz. in the 33d of Edward I [y]. Theſe are our only ſix ancient boroughs, and the number was neither diminiſhed nor increaſed, till the 6th of Edward VI. excepting only in one inſtance, which ſhall be taken notice of in the ſequel.

At this time (viz. in the latter end of the reign of Edward VI.) ſeven other boroughs, viz. *Saltaſh*, *Camelford*, *Weſt-Loo*, *Granpont*, *Tindagel*, *Michel*, and *Newport*, were permitted to ſend up two members each.

In the firſt of Mary, *Penryn*, and in the fourth and fifth of the ſame reign, St. *Ives* had the like privilege.

In the firſt of Elizabeth *Tregeny* was admitted; in the fifth St. *German*'s and St. *Maw*'s, in the 13th *Eaſt-Loo* and *Fawy*, and in the 27th of that reign *Callington*, making up the number of twenty one boroughs, which with the county return to parliament forty four members.

The reaſon of this modern addition to the boroughs of this county, may I think beſt appear from conſidering that the dutchy of Cornwall, (then in the crown and oftner ſo than ſeparated from

[w] Cornwall ſends forty four members to parliament, and Scotland forty five.

[x] Sherborne, Mancheſter, Birmingham, Ely, Burton upon Trent, Leeds and others.

[y] Not. Parliamentaria, by Dr. Willis, page 37, &c.

from it [z]) yields in tin and lands an hereditary revenue, much ſuperior to what the crown has in any county in England, and that eight of theſe boroughs [a] had either an immediate or remote connection with the demeſne lands of this dutchy, a link formerly of much ſtricter union and higher command than at preſent. Four other boroughs depended on, or wholly belonged to religious houſes which fell to the crown at the diſſolution of Monaſteries, in the reign of Henry VIII. For inſtance, *Newport* roſe with Lanceſton priory [b], and with it fell to the crown. *Penryn* depended much on the rich college of Glaſney and its lands; the manor alſo was alienated by Edward VI [c]. but reſtored by Queen Mary, and the town privileged by her. St. *German*'s was (after Bodman) the chief priory in Cornwall, and the borough of *Fawy* fell to the crown with the priory of Trewardraith, to which it belonged.

The other boroughs remain to be taken notice of. Michel belonged to the rich and highly allied family of the Arundels of Lanhearne, and St. Ives and Callington to the family of Pawlet (Marquis of Wincheſter, now Duke of Bolton) by marrying the heireſs of Willughby Lord Brook, ſome time of Newton-ferrers in this county [d]. Now theſe ſeveral connexions of the additional boroughs may point out to us the riſe of this privilege.

Henry VII. reduced the power of the ancient Lords, and conſequently advanced that of the Commons: Henry VIII. enriched many of the Commons with Church-lands; and in the latter end of the reign of Edward VI. the Duke of Northumberland could not but perceive of what conſequence it was to his ambitious ſchemes to have a majority in the houſe of Commons; and Cornwall ſeems to have been pitched upon as the moſt proper ſcene for this ſtretch of the prerogative, becauſe of the large property [e], and conſequently influence of the Dutchy: Six towns therefore depending on the Dutchy and Church-lands, and one borough of a powerful family were indulged to ſend fourteen members. The miniſtry of thoſe days were not ſo defective in artifice as not to oblige powerful Lords now and then with the ſame indulgence which they granted to theſe boroughs, thereby endeavouring either to reconcile them to their adminiſtration, or to make this guilty increaſe of the prerogative

[z] Whenever the Sovereign has no eldeſt ſon, the Dutchy of Cornwall is in the Crown.

[a] Saltaſh, Camelford, Weſt-Loo, Granpont, Tindagel, Tregeny, St. Maws, and Weſt-Loo.

[b] The religious of St. Stephen's Collegiate Church being removed from the brow of the hill into a lower ſituation, contiguous to the walls of Lanceſton, about three hundred years before, the town of Newport was built on the ground adjoining.

[c] Not. Parliamentaria, vol. II. page 109.

[d] Of which family one Lord was buried in the Church of Callington, where his tomb is ſtill to be ſeen.

[e] In the fifteenth of Henry VIII. the revenues of the Dutchy of Cornwall, with its dependant rights and manors, was reckoned, ſays Sir. J. Doderidge, at ten thouſand and ninty-five pounds eleven ſhillings and nine pence, which property became greatly increaſed by the fall of religious houſes in the end of the reign of Henry the eighth.

leſs

leſs invidious. Queen Mary in her ſhort reign (probably from the ſame motives) admitted two more, and Queen Elizabeth, who never rejected any political precedent which might confirm her power, (though always, it muſt be owned, exerting that power for the proſperity of her people, as well as her own glory) admitted ſix other boroughs.

The only inſtances which could give the leaſt colour of juſtice to theſe proceedings, were few, and weak. The borough of Tregeny ſent burgeſſes, indeed twice, *viz.* in the twenty-third and thirty-fifth of Edward I. but no more till the firſt of Elizabeth. Eaſt-Loo and Fawy ſent one and the ſame merchant, then called a Ship-owner, to a *council* at Weſtminſter (not to Parliament) in the fourteenth of Edward III[f]. Of theſe, however, Queen Elizabeth laid hold for the more ſpecious promoting her deſigns: In her firſt year ſhe revived the claims of Tregeny; in the fifth of her reign[g], "Burgeſſes being returned for St. Jermyne's and St. Maws in Cornwall, Mr. Speaker declared in the Houſe, that the Lord Steward agreed they ſhould reſort unto the Houſe, and with convenient ſpeed to ſhew their Letters-Patents why they be returned in this Parliament:" "But they were no farther queſtioned (ſays Dr. Willis, ib. page 168), the Queen's inclinations being well underſtood."

In the thirteenth of Elizabeth both Eaſt-Loo and Fawy elected two members, which being taken notice of and examined into, "" Report was made by the Houſe of the validity of the Burgeſſes, and it was ordered by the Attorney-general's aſſent, that the Burgeſſes ſhall remain according to their returns; for that the validity of the charters is elſewhere to be examined, if cauſe be[h]:"" "By which means, ſays Dr. Willis, (ib. page 102) little or no diſpute being made againſt the Queen's power, the houſe became greatly increaſed with repreſentatives, eſpecially by the ſending of Burgeſſes from thoſe boroughs."

Nor was it any objection, I imagine, to their ſending up members, that theſe boroughs had little trade, few inhabitants, and thoſe poor and of no eminence; theſe circumſtances in all likelihood did rather promote than prevent their being privileged, as rendering them more tractable and dependant than if they had been large and opulent towns, inhabited by perſons of trade, rank, and diſcernment.

It is true indeed, theſe places ſo ſummoned were old boroughs (in the legal acceptation of the word), that is, had immunities granted them by their Princes or Lords, exemptions from ſervices in other

[f] See the original writ, Pryn. Brev. Parliament. vol. IV. page 186, 187, where J. Shakelok was returned at the ſame time for Polruan only, and theſe Members allowed for forty-four days in going to, ſtaying, and returning from Weſtminſter, four pounds twelve ſhillings.

[g] Pryn. Brev. Parl. vol. IV. page 1178.

[h] Pryn. Parl. Regiſter, part IV. page 1179.

courts,

courts, privileges of exerciſing trades, of electing officers within their own diſtrict, and inveſted with the property of lands, mills, fairs, &c. paying annually a certain chief or fee-farm rent; moſt of them alſo were parts of the ancient demeſnes of the Crown, and had been either in the Crown or in the Royal Blood from the Norman conqueſt [i], and by paſſing to and from the Crown often, and their privileges conſtantly reſerved and confirmed at every transfer, theſe towns had acquired a kind of nominal dignity, but were in every other light inconſiderable, aud no ways entitled to the power of ſending members to Parliament, much leſs in preference to ſo many more populous communities in the other parts of England.

SECT. XVI. Trade.

The chief trade in Cornwall conſiſts in exporting tin, copper, and fiſh, and the principal imports are timber, iron, hemp, and ſuch other neceſſaries as mining and fiſhing require. The Corniſh had a privilege granted by Charles the firſt, for their ſteady attachment to the royal cauſe, of trading to all parts of the world [k]; a privilege of more credit than profit, ſince trade has been fettered and ſo confined to excluſive companies; this however can be no excuſe for that dangerous abuſe of trade, called ſmuggling. The common people on the ſea-coaſt are, it muſt be owned, too much addicted to carry off our bullion to France, and bring us back nothing but brandy, tea, and ſome other luxuries of life; nothing can be more pernicious to the intereſt of this county, as well as the kingdom in general, or to the conſtitutions of the inhabitants: the infection is ſpread below the rank of birth and fortune; there is not the pooreſt family in any pariſh which has not its tea, its ſnuff, and tobacco, and (when they have money or credit) brandy, and it is greatly to be feared that this deſtructive trade will not ceaſe as long as the duties are ſo high, and conſequently the profit of clandeſtinely importing foreign uncuſtomed goods ſo great and tempting.

SECT. XVII. Corniſh tenures and revenues.

The Corniſh tenants uſually chuſe not to hold lands at a rack or yearly rent, but to pay a fine, and take lands of the Lord of the Soil, for the term of ninety-nine years determinable with the lives of three perſons named in the grant or leaſe. This method of taking, they ſeem to have been inclined to, firſt, becauſe their general turn being to mining, farmery is not ſo well underſtood here as in other parts; ſecondly, becauſe the profits of mines and fiſhing come by ſtarts, and after a lucky year, the owner not knowing well the management of caſh, chuſes to have ſome certain

[i] Once only excepted, when Pierce Gaveſton was by the favour of Edward II. Earl of Cornwall for a ſhort time.

[k] Camden, Annot. page 8.

income

income for it; and leaſt it ſhould waſte in an improper chanel, he depoſits it with his landlord, and either takes a new leaſe or renews his old one; thirdly, the numbers of people on the ſea-coaſt, and in the tinning parts conſtantly increaſing, occaſion the dividing and ſplitting large tenements, equally to the advantage of the Lord, and the conveniency of his tenants, every one being willing to have a ſmall ſhare of houſe and land for his own life, and that of his neareſt dependants in proportion to his ability. For a leaſe of three lives, the taker uſually pays fourteen years value of the real annual profit of the eſtate, ſo that if the eſtate is worth ten pounds *per annum*, the tenant will not ſcruple to give one hundred and forty pounds fine, beſides the conventionary rent of one ſhilling *per* pound, *viz.* ten ſhillings reſerved annually to the Lord; but this uſage admits of ſome abatements if in a neighbourhood thinly inhabited, and ſwells into a conſiderable increaſe, where the people are numerous, and trade and employ briſk; ſo that in ſome tin-pariſhes moſt tenements bring twenty years value for a leaſe of three lives, inſtead of fourteen. Other tenures there are, both of the Dutchy, Biſhop's lands, and private Gentlemens Manors, which are conformable to the particular cuſtoms of each manor, as in other parts of England. Of the Eccleſiaſtical revenues, I find the following calculation in Mr. Hals's MS; but whether juſt or otherwiſe, I am not ſufficiently informed to decide: "The yearly revenues of the parochial Churches of Cornwall, were computed (ſays Mr. Hals) by Edward Herle of Prideaux, Eſq; in the year 1602, at ſixteen thouſand ſix hundred and twenty pounds; the lay impropriations annually at eight thouſand two hundred pounds. The Lord Biſhop of this dioceſe is Lord of ſeveral manors and lands in Cornwall, worth annually, if they were not leaſed, twelve thouſand pounds; the lands which formerly belonged to religious houſes, if not leaſed, are worth annually twenty thouſand pounds. In this computation, chanteries, oratories, and hoſpitals are not included."

SECT. XVIII.

Of the Corniſh language: its idiom, proverbs, declenſion, and expiration.

The Corniſh tongue is a dialect of that language which, till the Saxons came in, was common to all Britain, and more anciently to Ireland and Gaul; but the inhabitants of this iſland being diſperſed before thoſe conquerors, and driven into Wales and Cornwall, and thence into Bretagne in France, the ſame language (as in like caſes will always happen), for want of more frequent intercourſe, became differently pronounced, ſpoke, and written, and in different degrees mixed with different languages: Hence came different dialects, one called the Welſh, the other the Corniſh, the laſt the Armoric. The radicals are ſo much alike in all, that they are known and admitted by the inhabitants of either country; but their

Grammar has ſo varied, that they cannot converſe [l]. The Corniſh is reckoned more pleaſing in ſound becauſe leſs guttural than the Welſh, and indeed than the other dialects. Thus, for inſtance, the Welſh ſay *Lech* or *Llech*, a flat ſtone, the Corniſh, *Léh*. For *Lhwch*, (in Welſh a lake) the Corniſh ſay *Lûh*, &c. "The Corniſh, ſays Mr. Scawen, (M S, page 5) is not gutturally to be pronounced as the Welſh, nor mutteringly as the Armoric, nor whyningly as the Iriſh; ill qualities contracted by the two latter from their ſervitudes and much ſubjection, but the Corniſh is manly and lively ſpoken, and like thoſe other primitive tongues," *viz.* Celtic and Phenician. Again: "It is a tongue, as uſed in Cornwall, moſt like the Phenician," ibid [m]. and this intermixture of the Punic is the reaſon that the idiom of a poem written in Corniſh, and called the Paſſion [n], is not eaſily underſtood by the Welſh [o]. It has alſo the character of being elegant and manly [p], pure, ſhort, and expreſſive [q].

The moſt material ſingularities in this tongue are, that the ſubſtantive is placed generally before the adjective; the prepoſition comes ſometimes after the caſe governed; the nominative, and governed caſe, and pronouns, are oftentimes incorporated with the verb; letters are changed in the beginning, middle, or end of a word, or ſyllable; ſome omitted, ſome inſerted; and (much to the commendation of this tongue) of ſeveral words one is compounded (as in the Greek) for the ſake of brevity, ſound, and expreſſion [r]. There was nothing printed in this language till the learned Lhuyd publiſhed his Corniſh Grammar. The M S S in the Bodleian Library have been already mentioned [s], to which I muſt add, that in the Cotton Library there is a Corniſh Vocabulary [t]; there are alſo ſeveral proverbs ſtill remaining in the ancient Corniſh, all ſavouring of truth, ſome of pointed wit, ſome of deep wiſdom.

Neb na gare y gwayn coll reſtoua; He that heeds not gain, muſt expect loſs.

Neb na gare y gy, an gwra deveeder; He that regards not his dog, will make him a choak-ſheep.

Guel yw guetha vel goofen; It is better to keep than to beg.

Gura da, rag ta honan te yn gura; Do good, for thy ſelf thou doſt it.

Many proverbs relate to caution in ſpeaking, as *Tau tavas*, be ſilent, tongue.

[l] Scawen, M S, page 3.
[m] Ibid. page 3, from Boxhornius and others.
[n] See before, page 297, called Mount Calvary.
[o] Ib. Scawen, ib. page 5.
[p] Ib. page 27.
[q] Ib. page 51, and in preface to the Paſſion, Ibid.
[r] Of which ſee Lhuyd's Archæologia, page 225, &c.
[s] Page 295.
[t] Printed in the Vocab. at the end of the Antiquities of Cornwall.

Cows

Cows nebas, cows da, ha da veth cowſas arta; Speak little, ſpeak well, and well will be ſpoken again.

Of talking of ſtate-affairs, there are ſome remarkable cautions:

Cows nebas, cows da, nebas an yevern yw an gwella; Speak little, ſpeak well, little of public matters is beſt.

The danger of talking againſt the government is excellently repreſented in the following proverb:

Nyn ges gûn heb lagas, na kei heb ſcovern; There is no downs without eye, nor hedge without ears.

This language was ſpoke ſo generally in Cornwall down to the reign of Henry VIII. that Dr. John Moreman [u], Vicar of Menhynnet (aliàs Mynhinet) in Cornwall, in the latter part of that King's time is ſaid to have been the firſt who taught his pariſhioners the Lord's Prayer, Creed, and Ten Commandments, in the Engliſh tongue. When the Liturgy, at the Reformation, was appointed by authority to take place of the maſs, the Corniſh deſired [w] that it ſhould be in the Engliſh language, being apprehenſive that it might be injoined them in their mother tongue, as it was with regard to the Welſh. By this means, and the gentry's mixing gradually with the Engliſh, the Corniſh language loſt ground in proportion as it lay nearer to Devon. In the pariſh of Pheoke the Corniſh tongue reſiſted the ſcythe of time ſo long, that about the year 1640, Mr. William Jackman, then Vicar thereof, was forced to adminiſter the Sacrament to the communicants in the Corniſh, becauſe the aged people did not underſtand the Engliſh tongue [x]. After the Reſtoration we find the Corniſh ſurviving only in the more weſtern parts, where the Rev[d]. Mr. F. Robinſon, Rector of Landawidnek, is the laſt that I have met with, who, not long before the year 1678, preached a Sermon in the Corniſh language only [y]. About fifty years ſince it was generally ſpoken in the pariſhes of Paul and St. Juſt, the fiſhermen and market-women in the former, and the tinners in the latter, converſing one with the other for the moſt-part in the Corniſh tongue. A little before this time (*viz.* in 1700) Mr. Ed. Lhuyd before-mentioned (to acquaint himſelf with the Natural Hiſtory and Monuments, but principally with the language, in order to perfect his Archæologia) came into Cornwall, and by the hints which he collected, and the eſpecial aſſiſtance of Mr. John Keigwyn (a gentleman well verſed in the learned languages, as well as his own) compoſed his Corniſh Grammar. This he afterwards publiſhed in 1707, and being by that time thoroughly acquainted with the other dialects of the Britiſh tongue, was able

[u] Native of South-hole in Cornwall, that is, f. Southill, aliàs Suthull, (as in the Lincoln Viſitation) in Cornwall.

[w] Scawen, ib. page 49.

[x] "As he often told me," ſays Mr. Hals.

[y] See Scawen's MS, ib. ut ſup. page 49.

to

to correct the errors of the modern Corniſh, who, in many particulars, had greatly degenerated from the orthography of their forefathers, and wanted a reformer of ſuch capacity to chaſten and reduce their ſpeech to the true radical original elements. His Grammar will preſerve the rudiments of this language as long as his works remain, which will be as long as any regard for etymology and the ancient hiſtory of theſe kingdoms ſubſiſts. It lays a foundation alſo for correcting the MSS we have in this tongue, and by diligently examining, collating, and making proper extracts from the cleareſt parts of them, for perfecting a Cornu-Engliſh and an Anglo-Corniſh Vocabulary.

That we may attend it to the grave, This language is now altogether ceaſed, ſo as not to be ſpoken any where in converſation; but as our ancient towns, caſtles, rivers, mountains, manors, ſeats, and families, have their names from the Corniſh tongue, and as moſt of the technical names of mining, huſbandry, fiſhing, and indeed ſome terminations of lands are in Corniſh [z], it will in all ages be entertaining, and upon many occaſions uſeful and inſtructive for this county to have as correct and copious a Vocabulary of its ancient language, as can be procured from the materials now extant.

SECT. XIX. The preſent ſtate of arts in this county.

In diſcourſing of the arts now practiced in this county, I intend not to diſplay their perfections, and applaud their late advances, but to point out their deficiencies, and hint at their improvement. About fifty years ſince the principles and powers of mechanics were but little known among the Corniſh: they generally drew the water from their mines by dint of human labour, which was extremely expenſive, tedious, and impotent. Within theſe thirty years, their hydraulics are greatly improved, their horſe-engines, water-wheels, and fire-engines are ſtill growing more numerous, moſt of them now built by the natives, and gradually prevailing againſt inveterate cuſtoms, which are not to be got the better of all at once. Theſe engines are ſtill capable of farther improvement, particularly the horſe-engine, called the Whim, whoſe cylinder, vulgarly called the Cage, which winds and unwinds the rope, I have obſerved in moſt places of too ſmall a diameter, ſo that it has not the power it is capable of with equal labour: this whole machine alſo wants a proper check, ſo as that it might be eaſily controlled, or ſtop itſelf (as the fire-engine will do when the motion becomes too violent), for want of which many fatal accidents happen to men as well as horſes. A thorough knowledge of mechanics is indeed ſo neceſſary to mining, that one would wonder how they could carry on mines here formerly with ſo ſmall a

[z] Antiquities of Cornwall, page 374.

ſhare

ſhare of it: at preſent the Corniſh are very ſenſible of this, and there is ſuch a conſtant call at one mine or other, that no man who is induſtrious, and underſtands mechanics, can fail of a handſome livelihood.

Our huſbandry would doubtleſs admit of ſeveral improvements, but two more obvious than the reſt; as, firſt, ploughing and harrowing with large horſes, inſtead of the preſent much ſlower progreſs of our oxen; ſecondly, of introducing the wheel-plough in many plain and even parts of the county, whereby the weight would be much diminiſhed, and the work accelerated. Tillage.

The wheel-carriages for timber and heavy loads may alſo be improved; for our butts and wains have only two wheels, and thoſe of ſmall diameter: the four-wheel waggons, for carrying hay and corn, are more capacious, and as the wheels ſupport the burden and leave no dead weight on the cattle, are much to be preferred: the lighter carts alſo for expedition muſt much exceed our butts, and will carry more, but are not ſo much in uſe as might be wiſhed: however, as the highways in moſt parts of the county have been of late years much widened, levelled, and repaired, it is to be hoped that the ſame method of carriage which experience has recommended to the moſt knowing and buſy parts of the kingdom, will alſo ſoon take place here. It has been already hinted how eaſily our water-carriage may be extended, by making our rivers navigable either by leats and canals, or by locks, and the advantages accruing from thence to huſbandry, and every other employ, are too apparent to be farther particularized. Carriages.

Our fences, eſpecially in the northern and weſtern parts, might be bettered, that is, more commonly planted, which would make the partitions of our fields more laſting, as well as more ſightly; and if tenants were encouraged, and obliged by covenant with their Lords to plant every new hedge they made, not only with quickſet, but with young ſaplings of oak, aſh, elm, or ſycamore, the deſolate nakedneſs of ſtone and meer turf hedges in ſo mild a climate, would ſoon be at an end, and ſufficient compenſation made to the planters in fuel and ſhelter. We have many lands partly over-run with ſea-ſands, which ſands, eſpecially on the north coaſt, are of a very ſhelly, prolific kind[a]; perhaps ſaffron might be cultivated in ſome of the moſt ſandy ſoils to great advantage. Fences.

We have plenty of wool in moſt parts of this county; but this wool has been generally ſold to chapmen, who travel on purpoſe to buy and carry it off, and 'tis neither carded, ſpun, or weaved, but in very few places. This being obſerved by ſome publick-ſpirited gentle- Wool.

[a] See ſands, page 83.

men, they undertook (for which they are greatly to be commended) to ſet up a woollen-manufactory in the town of Penryn, ſituated in Falmouth Harbour. This attempt hath ſucceeded (though now ſcarce paſt its infancy) according to expectation, and in its different branches already employs ſix hundred people. "The goods they make for ſale, and which by repeated trials they find they can ſend to foreign markets as good in quality and on equal terms with other parts of the kingdom, are thoſe which follow[b]: Coarſe broad-cloths, druggets, duffles of all kinds, bays's, barragans figured and plain, watered grograms, corded and figured everlaſtings, figured and plain duroys, pluſhes, durants, and ſhalloons, beſides ſome other particulars not deemed ſtanding articles. By ſuch a variety of articles, they are at liberty to ſhift their hands in general from one kind of looms to another, till the majority of their workmen become capable of almoſt every different kind of weaving: this enables them to execute any extraordinary orders much ſooner, and upon decline of ſales abroad for any one ſortment, transfer their labourers to another branch; by this means they need not diſcharge any of their ſervants, and alſo work up the different ſorts of wool which the country produces, to the great relief of the induſtrious poor; whereas moſt part of the natural produce of the ſheep was before, either ſent into other counties to be manufactured, or into France in exchange for tea and brandy, to the inconceivable advantage of our rival nation, and of the moſt pernicious conſequence to our own." It is to be hoped that no perſon, who is able to lend the leaſt ſupport to ſo uſeful an attempt, will ſuffer it to decline for want of it.

Flax and nets.

Again: We have the flax and thread for our pilchard-nets moſtly from Bridport in Dorſetſhire, nay even the nets are often made there; but it would be far more to the advantage of the Corniſh, if the materials for netting were raiſed on the ſpot, and women and children employed in breeding nets, when the fiſhery is out of ſeaſon, and bad weather ſets in.

Meaſure of grain.

Our common meaſure of grain is ſingular, and not ſo ſettled and uniform as it ſhould be, the buſhel varying in different parts of the county from ſixteen to twenty-four gallons. The buſhel in the eaſtern parts contains betwixt eighteen and twenty-four gallons, in the weſt is reckoned always to contain three Wincheſters, or twenty-four gallons, and ſome will unjuſtly increaſe even this by a gallon or more, for the ſake of raiſing the price of what they ſell at home without the additional gallon, or in concert with the bakers, endeavouring to raiſe the market price, and thereby countenancing the making bread of ſhort weight, conformable to that exorbitant price.

[b] Letter dated Auguſt 27, 1757, from Mr. Richard Williams, Surgeon, of Falmouth, to whoſe aſſiduity and direction the preſent ſucceſs of this undertaking is chiefly to be attributed.

In

In Cornwall the cuſtomary perch for land-meaſure is alſo eighteen feet, though of late years moſt gentlemen comply with the ſtatute-perch of ſixteen feet and a half; but the moſt extraordinary meaſure of all, is the Corniſh acre, which, according to Mr. Carew, (page 36, and Norden, page 26) contained two hundred and ſeventy ſtatute-acres, which kind of account, ſays Norden, (who was ſurveyor to Henry Prince of Wales, and Duke of Cornwall, temp. Jac. I.) is not elſewhere in England. "Commonly, ſays Mr. Carew[c], thirty acres make a *farthing land*, nine *farthings* a Corniſh acre, and four Corniſh acres a Knight's fee; but this rule[d] is overruled to a greater or leſs quantity, according to the fruitfulneſs or barrenneſs of the ſoil." Mr. Carew, it is not to be doubted, had his authority, though not cited; but whatever it was, the Corniſh acre certainly varied much in different times and places from this aſſigned ſtandard; for in the regiſter of Lacy (Biſhop of Exeter, A. D. 1420, page 419), the Corniſh acre contained four ferlings [*aliàs farthings*], each ferling conſiſting of thirty acres ſtatute-meaſure, each Corniſh acre being deemed a *tenure*, and containing no more than one hundred and twenty ſtatute acres, as appears by the following recital: "*Item idem Thomas Abbas de Taviſtoke* XVI tenuras, *& dim. conſuetudinare prefati Manerii in libertatem demiſit, quarum quelibet continet in ſe unam* Cornubicam *terræ, et quelibet Cornubica continet in ſe* IIII ferlingas, *et quelibet* ferlinga XXX *acras:*" but even this meaſure was not always preciſe and invariable, for in the ſame regiſter (pages 450 and 451) the ſeveral cloſes contained in a *ferlinga* or *farthing-land* make up thirty-two acres, conſequently a tenure or Corniſh acre of four ſuch *ferlinga*'s makes one hundred and twenty-eight acres. Neither was the *ferlinga*[e] always uniform; for ſometimes it conſiſted only of ten acres[f]. Land-meaſure.

Certain it is that acres were anciently of different extent in different places, and in general of greater extent than they are by the preſent computation; the Iriſh acre continued even to the laſt century to contain three of the Engliſh, but what were the preciſe contents of an acre among the Anglo-Saxons is uncertain[g]. The preſent dimenſions of an acre, *viz.* one hundred and ſixty ſquare perch of ſixteen feet and a half, were ſettled by the 31 of Edw. I[h], and in the ſucceeding reign eight hundred ſuch acres made a Knight's fee, but in Cornwall at that time four Corniſh acres, containing one thouſand and eighty ſtatute-acres, were required to make up one Knight's fee[i].

What ſhould be the reaſon that our fore-fathers ſo much exceeded the reſt of this iſland in their land-meaſure, I do not preſume to determine;

[c] Ibid.
[d] As to the Knight's fee.
[e] *Aliàs ferlingus*, Spelman, page 212.
[f] Decem acre terre *faciunt* ſecundum antiquam conſuetudinem unam *ferdellam*, &c. Spelm. Gloſſ. page 212.
[g] Spelm. in voce acra.
[h] Ibid.
[i] Carew, ibid.

determine; I conjecture, that the inhabitants having their reſources for the neceſſaries of life from the bowels, and not from the ſurface of the earth, neglected the latter out of too conſtant an attention to the former. The ſoil and the ſurface therefore being uncultivated till the laſt ages *, inclines me to think that a greater quantity of land was requiſite to make up an acre, and entitle a man to the honour of knighthood in Cornwall than elſewhere. Let it be conſidered in the next place, that the word acre did not always ſignify a determinate quantity of ground, but "*latum quantumvis agrum*[k]," that is, a field or tenement of any ſpace; that whilſt the lands lay in this coarſe condition there were no diviſions but thoſe of tenements, which were uſually granted by the Lords of the Soil in ſuch dimenſions as contained many of our ſtatute-acres, and in any quantity which was thought at that time ſufficient for the purpoſes of tillage and paſture; hence aroſe the term of the Corniſh acre, meaning no more than a Corniſh holding or tenement, *hide* or *tenure*, including more or leſs[l], according to the degree of cultivation[m].

Earths. For making porcelain, as well as preparing ochres and other painting-earths for the artiſt, a great many clays and mineral-earths may be found in Cornwall[n]; water-mills may eaſily be procured, fuel cheap, and water-carriage to London and Briſtol ſo convenient on either ſide the county, that a ſufficient undertaker might at leaſt find as many encouraging circumſtances to ſet up ſuch manufactures in Cornwall as any where in England.

Salt. Sea-ſalt may be made here as well as in French Britany, for the materials are the ſame, and in equal plenty in both countries, and the difference of climate inconſiderable, "it being found by experience, ſays a modern author[o], that bay-ſalt made in Hampſhire (farther within chanel than Cornwall) is not inferior to the bay-ſalt of Britany:" but ſuppoſing we could make in Cornwall but two thirds of the ſea-ſalt which the Bretons make, this, if I am rightly informed, would very well anſwer. There is a place in the pariſh of Senan, about half a mile north of the Land's-End, in which the traces of ſalt-works, carried on in the laſt age, are ſtill to be ſeen; and tradition ſays, that the manufacture miſcarried not through any deficiency of materials, or incongruity of ſituation, but through the neglect and diſhoneſty of the perſons employed.

Vitriol. About the year 1747, a curious foreigner[p] ſet up a vitriol manufacture near Reddruth. The water was collected from places where tin was burnt in order to diſcharge its mundic, and copper-

* See page 84.

[k] Spelman, ibid.

[l] In Lacy's Regiſter one hundred and twenty, in Spelman one hundred and ſixty, in Carew two hundred and ſeventy ſtatute-acres.

[m] See page before, "Item idem abbas," &c.

[n] See clays, page 63, &c.

[o] Nat. Hiſt of Cork, vol. II. page 250.

[p] Dr. John James Rouby, now at Plymouth.

ores

ores were moſt uſually waſhed. This water, ſtrongly impregnated with the vitriolic particles which theſe ores abound with, was firſt put into a large lead ciſtern, where it reſted till the ſediment ſubſided, and the water was clear: it was then conveyed into a boiler of the ſame metal, where it was kept conſtantly boiling by a gentle fire for ſeven or eight days, and when they found it ready, that is, by evaporation reduced to a proper pellicle (which they diſtinguiſh by the colour) it was drawn off through a cock at the bottom of the boiler, and ſet in leaden ciſterns to cryſtallize, the ſalts ſhooting round the ſides of the veſſel, and fixing upon pieces of timber thrown in on purpoſe to collect them. The time required for cryſtallization was either three or five days, according to the weaker or ſtronger impregnation of the water; about eight tons of which, well impregnated with the vitriolic quality, would give a ton of blue, fine vitriol, each ton worth eighty pounds, or near it, and the expence of making each ton not exceeding fifty pounds, as I have been informed. The materials for making this vitriol are ſo cheap, and in ſuch plenty, that the whole kingdom might be ſupplied with this ſalt from Cornwall alone, if neceſſary.

But of all arts, that which concerns moſt nearly the gentlemen of this county to cultivate, is that of aſſaying metals, an art which ſhould be much more generally known and practiſed, than it is at preſent, in a county ſo fertile in foſſils. Art of aſſaying.

The value of tin-ore is well known, of lead not ſo thoroughly, and the agents of the copper-companies are almoſt the only perſons who aſſay copper-ore: here therefore ends all our docimaſtic knowledge, and we are not only obliged to take the word of the buyer (which may naturally be ſuppoſed ſomewhat in favour of himſelf) as to our lead and copper, but our cobalt, biſmuth, ſpeltre, manganeſe, and the like, lie utterly unknown and neglected: Great pity it is that ſo many gentlemen of fortune and inheritance as the mine-diſtricts in this county may boaſt of, can find no link to aſſociate themſelves in ſo uſeful a deſign as that of employing a proper perſon, and erecting one or more aſſay-offices whereto every man at a ſmall expence might have acceſs for information, as to the value of his ore, and the nature of any new foſſil which occurs.

In ſome counties publick premiums, exhibited at the expence of a ſubſcribing ſociety, have had the deſired effect in furthering improvements of publick benefit; perhaps ſomething of the ſame kind would be of uſe in this county, and greatly promote the incloſing commons, planting fruit and foreſt-trees, making the moſt and beſt-finiſhed highways, improving the powers, or retrenching the expence of any hydraulic engine, diſcovering new and more

effectual fluxes for metals; manuring with Corniſh marle, improving the pottery-ware, or even introducing the porcelain or delf-manufacture; a deſign of this nature, animated by a few people of rank, from its own apparent and neceſſary conſequences, would ſoon make its way into the approbation and patronage of every man of opulency and publick ſpirit, and would be a ſure method of making the people more induſtrious, flouriſhing, and happy. But to encourage and promote arts moſt effectually in a country at ſuch a diſtance as Cornwall is from the great centre of power and riches, nothing can contribute more, than that gentlemen of fortune and rank generally reſide at their paternal ſeats, build, plant, and improve barren grounds, enforce juſtice, ſtimulate induſtry, excite emulation, reconcile diſputes, and lead forth now and then into the reach of favour and reward latent merit; ſuch occupations as theſe might well become the time and attention of thoſe of the higheſt rank, and the moſt affluent fortune; they are rational and generous, diffuſive of plenty and happineſs, in the place which has the firſt right (the right of birth) to our affections; they endear and hold faſt the dependants of the gentry, preſerve and advance their patrimonies, and need not in the leaſt claſh with or interrupt their more ſolemn duties to the Church and to the State.

CHAP. XXVII.

Antiquities which have occurred in Cornwall ſince the year 1753,

Urns. PLATE XXIX. Fig. I. page 298, is part of a curious urn; the *anſa* ſolid; the clay fine, well burnt; neatly ornamented, with double, ſtraight liſts round the edge and handle, and wavy liſts on the ſides; colour cinerous; the ſhell three eighths of an inch thick. It was found under a large barrow or heap of ſtones, at Karn, in the pariſh of Morvah, 1754.

Fig. II. ibid. A plain urn, incloſing human bones, found in Mr. T. Smith's garden in Newfort, in the iſle of St. Mary's, Scilly: it ſtood upon the natural clay, incloſed in a vault four feet ſix inches long, two feet three inches wide, about one foot three inches deep; the ſides of the vault were faced with ſtone, its covering, flat ſtones; the run of the vault N. N. E. This is inſerted as the only one yet diſcovered in the iſles of Scilly, to ſhew that theſe Iſlanders had the ſame way of burning the dead, and preſerving what the fire left unconſumed, as other ancient nations.

Coins. Fig. V. and VI. are two gold-coins found at Karn-breh in the year 1749, with thoſe publiſhed in the Antiquities of Cornwall, page

page 242; they ſeem both of the ſame die and value, but the impreſſion differently corroded by time and uſe, may, by being exhibited in both, tend to their explanation. I can ſay nothing deciſive as to the ſymbols, but I conjecture that on the convex ſide there is the rude figure of a ſhip with two maſts, and the ſails ſpread; on the convex ſeems a repreſentation of the terraqueous globe, encompaſſed in the middle with a zone *wavy*, which divides the upper from the under hemiſphere. In the upper hemiſphere are placed the ſun and moon, in the under the leſſer luminaries.

Fig. VII. and VIII. ibid. are two different heads from any already publiſhed in Plate XIX. of the Antiquities of Cornwall, page 242: the faces are bold, and not inexpreſſive, turned different ways; the reverſes are charged with horſes and wheels in the ſame ſtyle as moſt of thoſe already publiſhed.

Fig. IX. ibid. is not an ill fancied head; the diadem and its claſp very diſtinct and uniformly ſet, and the robing of the ſhoulder plain and indiſputable. In the reverſe, the body of the horſe is remarkably ſlender, the engraver, as I apprehend, being more intent to expreſs the expedition and ſwiftneſs, than the natural ſhape and proportion of the creature. The coins are of their real ſize and ſhape. I have only to obſerve, that Bouteroue's coins of the ancient Gauls have neither the weight nor true ſhape expreſſed, becauſe either worn with uſe, or covered or eaten with ruſt (ſays he, ibid. Introd. page 40). All publiſhed by him of this kind have plain legends, except B, page 55, which however on the reverſe has ſomething like the letters M A. They can give little aid therefore towards explaining this treaſure of Britiſh antiquity found in Cornwall; but if one can make any certain concluſion from coins printed in ſuch a manner, it muſt be that they were ſtruck by a people well acquainted with the Greeks or Romans; they ſavour nothing of the antiquity, rudeneſs, and ſimplicity of thoſe of Karnbrêh.

Fig. X. ibid. is the little peteril or ſtorm-finch *, which was drawn by the late Mr. Jago before-mentioned, Chaplain of Loo. Of this bird, rarely found on the Engliſh coaſts, Mr. Cateſby in the Appendix to his Nat. Hiſt. of Carolina, &c. (page and tab. 14) gives us the following account: "The ſtorm-finch or pittrel, is about the ſize of a chaffinch; the whole bird, except the rump, (which is white) is of a duſky, brown colour, the back being ſomewhat darker than the belly; the bill is half an inch long, ſlender, dark-brown, and crooked at the end: by opening the head of one of theſe birds, I found that the noſtrils conſiſted of two parallel tubes, proceeding from within the head, and running half way along the upper mandible of the bill, forming thereon a protuberance; the

* The bird mentioned before, page 247, and referred to the explanation of this plate.

wings

wings extended an inch beyond the tail; the legs were ſlender; the feet were webbed, with a ſmall claw on each heel without a toe: they rove all over the Atlantic Ocean, and are ſeen on the coaſts of America, as well as on thoſe of Europe, and many hundred leagues from each ſhore. Their appearance is generally believed by mariners to prognoſticate a ſtorm or bad weather, and I muſt confeſs I never ſaw them but in a troubled ſea: they uſe their wings and feet with ſurpriſing celerity; their wings are long, and reſemble thoſe of ſwallows, with which they are equally ſwift, but without making angles, or ſhort turns in their flight, as ſwallows do, but flie in a direct line. Though their feet are formed for ſwimming, they are likewiſe ſo for running, which uſe they ſeem moſt to put them to, being oftenеſt in the action of running ſwiftly on the ſurface of the waves in their greateſt agitation, but with the aſſiſtance of their wings." To theſe obſervations Mr. Cateſby adds its name from Cluſius. The ingenious Mr. George Edwards (to whom the Natural Hiſtory of Birds is ſo much indebted) juſtly obſerves (page 90) that "it is ſtrange ſo ſmall a bird ſhould be able to ſubſiſt in ſuch open ſeas, where they cannot reſt but on the water, which is always pretty rough. Thoſe I have ſeen were continually on the wing; they appear not but in tempeſtuous weather, near ſhips or land. Theſe I ſaw ſcreened themſelves out of the wind under the ſtern of the veſſel I was aboard of; they even ſeek ſhelter ſometimes in the deepeſt hollows that are formed between the high waves of the ſea, and wonderfully keep their ſtations there, though the waves run very ſwiftly; they flutter ſo near the ſurface of the water, that they ſeem to walk on it; for which reaſon, Mr. Albin ſays, they are called Peterils, becauſe they imitate Peter's walking on the ſea." Edwards of Birds, page 90 [q].

Roman roads in Cornwall.

In the Antiquities of Cornwall, book IV. chap. V. page 301, ſeveral evidences of the Romans being in Cornwall, and having made publick roads here are produced, and many more will probably appear upon farther ſearch, attention, and enquiry, of which the following notes may be a corroborating teſtimony: It is ſuggeſted, (Antiquities of Cornwall, page 305) that one Roman road at leaſt paſſed from the eaſtern parts through or near Truro; to confirm which, I find a tenement called Caerfôs (aliàs Caerfoſou) that is, the caſtle or encampment on the Dyk or Foſs, by which names the ancient ways are too frequently called to need farther proof; this tenement lies about a mile weſt of Granpont, adjoining to the preſent high road to Truro which is about five miles diſtant.

[q] Albin's Hiſtory of Birds, vol. III. page 87, table 92. Dampier's Voyages, vol. III. page 97.

"There

" There are the remains of a cauſey between Liſkerd and Looe, near Polgover, the ſeat of Mr. Mayow, which, as well as the croſs road from Dulo to Heaſenford, vulgar tradition makes to be Roman [r]." That the Romans had ways in theſe eaſtern parts of the county about Loo and Loſtwythyel, the following ancient work, ſhewn me by the Reverend Mr. Howel, Rector of Lanreath, (June 25 and 26, 1756) will abundantly confirm: It is called the Giant's Hedge; a large mound which reaches from the valley in which the two boroughs of Eaſt and Weſt Loo are ſituated, to Leryn, on the river Fawy *: It is firſt viſible on Weſt-Loo down, about two hundred paces above the mills, whence it runs to Kilmaenarth woods; from and through them to Trelaun wood, about three hundred paces above Trelaun mills; then through little Larnic to the Barton of Hall, in which there are two circular encampments about four hundred paces to the north of it; thence quite through the ſaid Barton, making the northern boundary of a field on the glebe of Pelynt Vicarage, called Furz Park; then croſs the Barton of Tregaric, and thence through the north grounds of Treſâſſon and Polventon to the glebe lands of the Rectory of Lanrêath, where I meaſured it ſeven feet high and twenty feet wide at a medium; thence it ſtretches through the tenement of Wyllacomb to Trebant water, whence it proceeds through the Barton of Langunnet and ſome ſmaller tenements to Leryn, from which there is a fair dry down, called St. Winnow Down, leading north along to Loſtwythyel. This Riſbank, or mound, ranges up-hill and down-hill indifferently; has no viſible ditch continued on any brow of a hill, as intrenchments always have; there is no hollow or foſs on one ſide more than the other; it is above ſeven miles long, and tends ſtraight from Loo to Leryn creek, in the direct line from Loo to Loſtwythyel. By all theſe properties, its height and breadth, its wanting the foſſes of fortification, its ſtraightneſs and length, the grandeur of the deſign, and the labour of execution, I judge, that it can be nothing leſs than a Roman work; in this ſuppoſition I am the more confirmed, firſt, becauſe ſeveral Roman coins have been found on the banks of Fawy river, (as ſee Antiquities of Cornwall, page 282) and as I have been informed alſo [s] in the run of this notable work; ſecondly, by its tendency to the firſt ford over the navigable river of Fawy; for it muſt be obſerved that the Romans thoroughly ſenſible of the delays and hazards of croſſing firths and arms of the ſea, and the danger of bridges getting into the poſſeſſion of the natives, were equally adverſe both to bridges

Giant's hedge.

[r] Letter, April 25, 1755, from J. Trehawk, Eſq; to whoſe kind communications the preceding ſheets are much indebted, eſpecially with regard to the Geography of the County.

* Alias Fowey.

[s] Letter from the foremention'd gentleman.

and paſſing large rivers; they had therefore in conſtant view the neareſt and moſt commodious fords of rivers, and directed their roads accordingly; now near Leryn creek, where this work ends, there is a ford, and no where below is the river Fawy fordable, which plainly accounts for their carrying this road ſo high up in the country, that it might at once convey their troops towards their ſtation at Loſtwythyel, and afford them a ſafe paſſage over the river Fawy into the weſtern parts, through Granpont and Truro.

Thus, my Countrymen, you have my obſervations on the moſt important points of the Natural Hiſtory of Cornwall, and if from the want of any thing within your reach here ſuggeſted, ye attend to the improvement and cultivation of ſcience, and from the great plenty of all things neceſſary to life, as well as of things in their own nature rich and peculiar to your Country here exhibited, ye learn to praiſe and adore the Gracious Giver; the Author has his ends, and is content with having purſued thoſe ends to the beſt of his power: he takes his leave therefore ſecure of the candid allowances which will be made for a work ſo various and on ſubjects ſo undecided, ſtill opening more and more to the inquiſitive Naturaliſt, yet in many particulars ſtill retiring from full and adequate conviction; known only enough to ſhew beyond contradiction the goodneſs, power, and wiſdom of God; and yet ſufficiently known, as being equally intended to exerciſe the patience, gratitude, devotion, and humility of man.

F I N I S.

E R R A T A.

N. *ſignifies* NOTES. *Other* ERRATA *are in the* TEXT.

Page	*line*	*for*	*read*
viii	1	Catagogue	Catalogue
ib.	27	that	this
2	8	Fauwy	Fawy
3		in Note f dele (--, inſert " from, *in time* to the end in Note l.	
4	4	Dacanatus	Decanatus
5	27	Tracks	Tracts
7	27	Vapours, uſed for exhalations in general.	
16		Dele colour at the bottom of the page.	
26	31	Occaſioned	occaſion
33	15	Poſſitively	poſitively
34	4	Diſcernable	diſcernible
ib.	40	Naphtha	naphta
35	9	Iron being	Iron is
41	1	Dele Here is a ſtone bridge of 15 arches.	
	ib.	Dele N. c repeated	
49		N. * J. Frehawk, Eſq;	J. Trehawk, Eſq,
53	12	Carelew	Carclew
ib.		N. x 1754	1757
55	21	The wind was freſh	The wind freſh
78	29	Mountians	Mountains
81	8	Dele, the	
81	22	near four miles	full four miles
85	23	which Grew *, dele *, and inſert it below at *aire*, line 41	
86		N. * tempus ab Euro	tempeſtas
102	24	Standard-water, dele the hyphen	
104	24	in the inland country	in an inland country
109	13	phænomina	phænomena

N. B. *The numbers applied to the different ſamples of Pebbles, Porphyry, Talc, Arbeſtos, and ſmall gems in the* 10*th Chapter, refer to the marks in the Author's collection, all which ſpecimens are intended to be depoſited in the* Muſæum Aſhmoleanum, Oxford, *for the ſatisfaction of the curious.*

115	38	inſert a comma at have,	
117	35	forms	form
118	25	diamond, ſubſtance	Diamond-ſubſtance
119	14	a paſſage repeated by miſtake from page 96.	
119	25	ſingle-diſpers'd	ſingle and diſpers'd
120	11	termining	terminating
120	39	XII	XIX
129	11	more plenty	in more plenty
131	26	a Pyrites	Pyrites
142	36	are equally	both equally
144	14	Dele ( )	
150	1	Dele between	
162	2	thongh	though
165	18	ſubtraction	ſubſtraction
171	1	Inſert) after ſhaft	
179	5	Waſt	waſte
189		N. x Roſwarn	Roſwarne
194	26	XIV	XVI
195	38	ocre	ochre
212		N. q ſee above	See before
217	23	County	Country
219	20	Inſert w the mark of reference to N. w	
219		N. * does ripen well	does not ripen well
221	14	dele ( )	
224	20	pluck'd this	pluck'd branches of this
227	13	Pedunculi	pediculi
ib.	ib.	Peduncule	pedicule
235	21	ſame	ſame Gentleman
240	9	Fig. x	Fig. VIII
241	21	dele not	
247	6	enabling them	enabling theſe birds
250	12	its, it,	her, ſhe,
253	35	or other	or other like inſect
256	19	lanquid	languid
258	19, 20	ten-cles	tentacles
259	24	mammillæ	mamillæ
259	36	ocre	ochre
260	21	ſame ſize	natural ſize
265	35	Aredi	Artedi
271	1	dele (	
284	27	the Phoca	Phoca
287	31	Maddern	Madern
294	3	the moſt	a moſt
305	38	*r* inverted in *merited*	

DIRECTIONS

For Placing the PLATES.